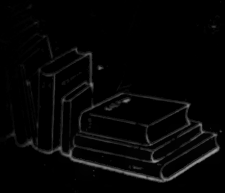
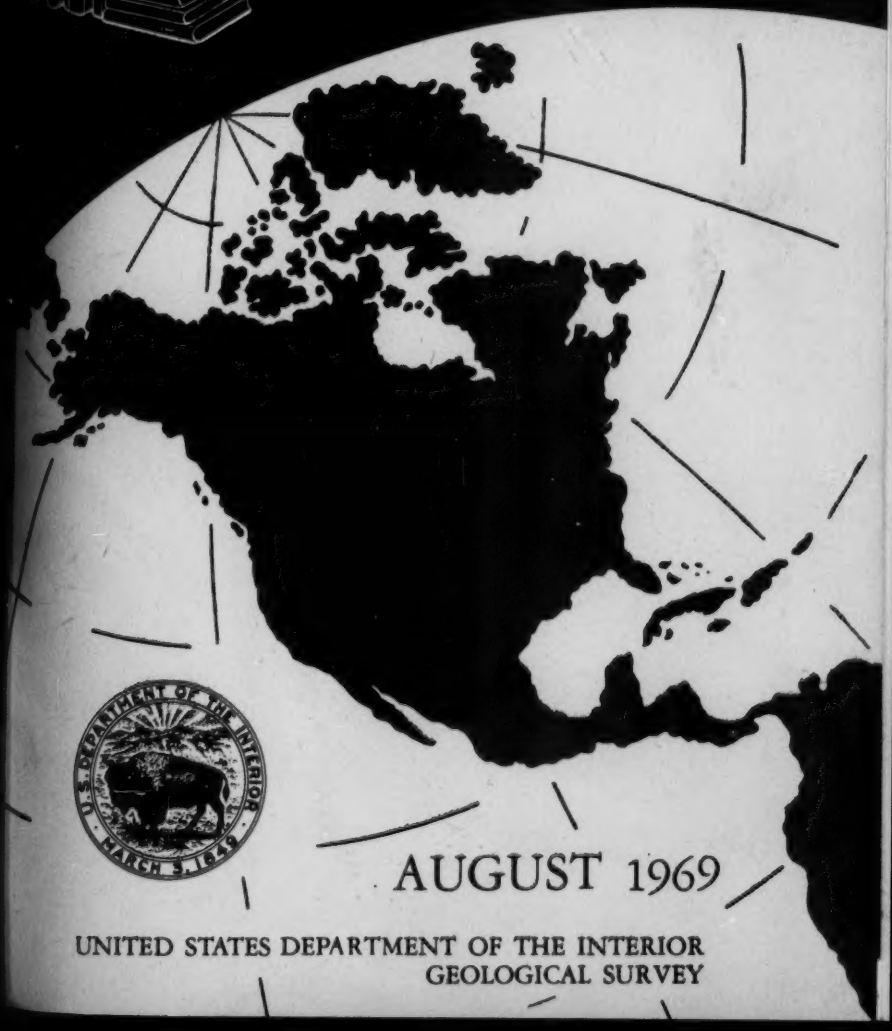
ABSTRACTS OF NORTH AMERICAN GEOLOGY





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UNITED STATES DEPARTMENT OF THE INTERIOR
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ABSTRACTS OF NORTH AMERICAN GEOLOGY

INTRODUCTION

Abstracts of North American Geology contains abstracts of technical papers and books and also citations of maps on the geology of North America including Greenland, the West Indies, as well as the State of Hawaii, Guam, and other island possessions of the United States. Articles of a general nature by North American authors are cited even through published in foreign journals, but those by foreign authors are included only if they appear in North American journals. Abstracts are prepared only of material that is believed to be generally available. Ordinarily abstracts are not published of material with small circulation (such as dissertations, open-file reports or memorandums) or of other papers presented orally at meetings.

The Abstracts is an additional reference tool but does not replace the Bibliography of North American Geology, which has been published by the Geological Survey since 1887. Twelve monthly issues of Abstracts of North American Geology are published each year. The Bibliography includes citations and subject index for a calendar year.

The numbers assigned to the abstracts in this publication are for reference in using the index; they are not order numbers. Publications cited here in abstract form are available in most geological libraries or through interlibrary loan.

Abstracts of North American Geology and the Bibliography are prepared by use of computer techniques. Each abstract, along with its indexing, is placed on magnetic tape and entered into a permanent data bank. The material prepared each month is published in the form of the present issue. The abstracts are arranged alphabetically according to senior author. A subject index follows the abstracts and is designed for rapid reference to any subject desired. Bibliographies can subsequently be retrieved according to the terms used in the index.

A list of journals commonly cited in Abstracts of North American Geology may be obtained by writing to the U.S. Geological Survey, Washington, D. C. 20242. Serial publications cited for the first time are as follows:

Earth Sci. Bull.—Earth Science Bulletin. Wyoming Geological Association. Casper, Wyo.

Geotectonics—Geotectonics. (Translation of Geotektonika, Akad. Nauk. SSSR). Translated and produced by Scripta Technica, for the American Geophysical Union. Washington, D. C.

Przegląd Geog.—Przegląd Geograficzny. Polskiej Akademii Nauk, Instytut Geografii. Panstwowe Wydownictwo Naukowe. Warsaw, Poland.

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ABSTRACTS

Aaron, John M. *See* Drake, Avery Ala, Jr. 00950

00710 **Abbott, Agatin T.** Lateral stream capture and plunge pool action as contributors to the development of amphitheater-headed valleys in the Hawaiian Islands [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 1, 1969.

00856 **Abou-Zied, Mohamed Saleh.** Geology and mineralogy of the Milford Flat quadrangle and the Old Moscow Mine, Star District, Beaver County, Utah [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 29, no. 7, p. 2490B-2491B, 1969.

Ackroyd, Earl A. *See* Vaughan, Kenneth D. 06892

06996 **Ackroyd, Earl A.** Streamflow regimen as applied to hydrologic systems analysis [abs.]: South Dakota Acad. Sci. Proc. 1968, v. 47, p. 351, 1968.

Ackroyd, Earl A. *See* Kume, Jack. 06998

06865 **Adams, B. W.; Davey, R. K.** Computer applications to open pit geology (emphasis on the geologic aspects) [abs.]: Mining Eng., v. 20, no. 8, p. 27, 1968.

06826 **Adams, J. A. S.** Gamma-ray spectrometric techniques [abs.]: Mining Eng., v. 20, no. 12, p. 57, 1968.

00711 **Addicott, W. O.** Late Pliocene marine mollusks from the northeastern Santa Cruz Mountains, California [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 1, 1969.

Addicott, Warren O. *See* Scholl, David W. 00906

Adent, William A. *See* Szasz, S. E. 00920

Ahr, Wayne M. *See* Logan, Brian W. 00763

Akers, J. P. *See* Cooley, M. E. 00959

00985 **Akimoto, Syun-iti; Syono, Yasuhiko.** Coesite-stishovite transition: Jour. Geophys. Research, v. 74, no. 6, p. 1653-1659, illus., table, 1969.

The coesite-stishovite transition curve has been determined over the temperature range 550° to 1200°C in the pressure range 82.0 to 98.0 kb by means of a tetrahedral-anvil type of high-pressure apparatus. Amorphous anhydrous silica, α-quartz, coesite, and stishovite were used as starting materials. The transition curve was fitted by the linear equation $P(kb) = 69 + 0.024T(C°)$ by using the pressure scale proposed by Jeffery and others [1966]. This determination was found to be in reasonable agreement with the previous data, if the common pressure scale is used. Experimental information for the coesite-stishovite transition was also compared with the stability relation derived from enthalpies and entropies of coesite and stishovite. It was suggested that the pressure scale proposed by Jeffery and others was considerably underestimated around 100 kb.—Authors' abstract

00898 **Aldrich, John K.** Gravity of northern Channel Islands [abs.]: Am. Assoc. Petroleum Geologists Bull., v. 53, no. 2, p. 470, 1969.

06984 **Alexander, Paul B.** Geophysical investigations within the Colorado Mineral Belt using new inductive electromagnetic instrumentation: Earth Sci. Bull., v. 1, no. 2, p. 11–15, illus., table, 1968.

Recent developments in instrumentation have called for a re-evaluation of inductive electromagnetic prospecting methods within the rugged terrain of the Rocky Mountains. This research was initiated in response to this need. The Leadville Limestone of the Colorado Mineral Belt was selected as the study target, and reconnaissance investigations were run. Three highly conductive anomalies were located, and their geophysical characteristics are evaluated. Subsequent drilling proved the conductors to be graphitic lenses within the Belden Shale. Although the investigation located no economic deposits, it did suggest several explorational innovations and showed the new instruments to be rapid and inexpensive in locating conductive bodies in areas of considerable relief.—Author's abstract

07052 **Aley, Thomas.** Hydrology of a karst watershed in the Missouri Ozarks: Caves and Karst, v. 10, no. 6, p. 49–55, illus., table, 1968.

The area overlies the Roubidoux Formation, predominantly sandstone. Major valleys have cut into the Gasconade Formation, a massive dolomite. The abundant sinks in the uplands are due to collapse in the Gasconade; some smaller sinks exist in the valleys. The soil cover has a large soil moisture storage capacity, replenished by precipitation; remaining water percolates downward and enters solution channels in the Gasconade and is discharged as springs. Valley bottoms produce very little surface runoff because of high percolation rates. Flow at McCormack Spring has been recorded; the watershed area has relatively deep soils with a large storage capacity. Falling Spring watershed has shallow soil with abundant bedrock outcrops, and a much smaller storage capacity. A water balance was calculated for both springs and the predicted yield correlates with it.—ESL

Alger, R. P. *See* Bond, L. O. 06829

00857 **Allen, Gary Curtiss.** Chemical and mineralogic variations during prograde metamorphism in the Great Smoky Mountains of North Carolina-Tennessee [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 29, no. 7, p. 2491B, 1969.

00712 **Al-Rawi, Yehya.** Petrochemistry of Cenozoic volcanic rocks in northern Mono Basin, California and Nevada [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 2, 1969.

Anderson, R. Ernest. *See* Ekren, E. B. 06795

06807 **Anderson, R. Ernest; Ekren, E. B.** Widespread Miocene igneous rocks of intermediate composition, southern Nye County, Nevada, *in* Nevada Test Site: Geol. Soc. America Mem. 110, p. 57–63, illus., tables, 1968.

Within a 2,000-sq-mi-area extending westward from the Belted and Reveille Ranges to the Tonopah-Goldfield area are lava piles up to 3,000 feet thick and dikes, sills, laccolithic masses, plugs, and stocks of intermediate composition. Their age is bracketed by two major ash-flow tuffs dated radiometrically at 22.3 and 17.8 m.y. They range in composition from andesite to quartz latite; individual types show chemical and petrographic similarity throughout the area. Some have a trend to higher-silica types with decreasing age, are pervasively altered, and are the chief hosts for precious-metal deposits. Such widespread similarity and age restriction suggest a broad substratum of magma tapped in numerous places. Available chemical, petrographic and radiometric data suggest that similar Miocene igneous activity was characteristic of an area extending to west-central Nevada and the central Sierra Nevada.—*from* Authors' abstract

Anderson, Robert F. *See* Somers, Lee H. 07095

07051 **Anderson, Sidney B.; Haraldson, Harald C.** Cement-rock possibilities in Paleozoic rocks of eastern North Dakota: North Dakota Geol. Survey Rept. Inv. 48, 62 p., illus., tables, geol. map, 1968.

An exploration drilling program was conducted in 1967 in search of limestone suitable for portland cement. Eight tests were drilled totalling 2,640 feet, with cored intervals totalling 800 feet. Primary objective was Ordovician Red River limestone, but several secondary objectives were also investigated, including carbonates of the Ordovician Winnipeg and Stony Mtn. Formations, and the Ordovician-Silurian Stonewall Formation. Two test holes were drilled in Pembina County, and six in Grand Forks County. In the latter, a 40-ft cored interval averaged 85.6 percent calcium carbonate although the magnesium carbonate content was a little higher than desirable. It is suggested that this Red River limestone be blended with the shaly limestone of the Niobrara.—*from* Authors' abstract

Anfilogov, V. N. *See* Chernyshev, L. V. 06979

06866 **Anzman, J. R.** Resistivity exploration in canal investigations [abs.]: Mining Eng., v. 20, no. 8, p. 28A, 1968.

Appleman, Daniel E. *See* Clark, Joan R. 07078

Applin, Esther R. *See* Maher, John C. 07067

Archambault, Ginette. *See* Valiquette, Guy. 06929

Archbold, Norbert L. *See* Shawe, Daniel R. 07018

Armbrustmacher, T. J. *See* Silberman, M. L. 00809

Armbrustmacher, Theodore J. *See* Wrucke, Chester T. 00808

00951 **Armstrong, Frank C.** Geologic map of the Soda Springs quadrangle, southeastern Idaho: U.S. Geol. Survey Misc. Geol. Inv. Map I-557, 2 sheets, scale 1:48,000, sections, 1969.

In addition to the geologic map and sections on Sheet 1, an inset Bouguer anomaly map of the quadrangle is included. Sheet 2 contains measured stratigraphic sections of the Middle Cambrian to lower Mississippian formations.—MCM

Ashlock, L. O. *See* Brown, D. A. 07042

Ave'Lallemant, H. *See* Raleigh, C. B. 00734

Avrett, J. R. *See* Turner, J. D. 06966

Avrett, J. R. *See* Shamburger, V. M., Jr. 07070

Avrett, J. R. *See* Reed, P. C. 07071

Avrett, J. R. *See* Newton, J. G. 07073

Avrett, J. R. *See* McWilliams, R. G. 07074

Avrett, J. R. *See* Newton, J. G. 07075

06827 **Babcock, C. O.** The effect of end constraint on the compressive strength of model rock pillars [abs.]: Mining Eng., v. 20, no. 12, p. 45, 1968.

00676 **Bacskai, Judith A.** Miocene porcupine fishes in California [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 3, 1969.

Baerreis, David A. *See* Bender, Margaret M. 00839

Baker, Naydean. *See* Clarke, James W. 00826

07014 **Baker, P. E.** Comparative volcanology and petrology of the Atlantic island arcs: Bull. Volcanol., v. 32, no. 1, p. 189–206, illus., tables, 1968.

Although situated in similar structural and geologic environments, the volcanoes of the Lesser Antilles and South Sandwich Islands show significant differences. It is suggested that these chains represent two distinct stages in volcanic island arc evolution. In the South Sandwich Islands the lavas are primitive tholeiites, generated in the upper mantle, and their derivatives; the Lesser Antilles represent a later stage in which the bulk of the lava is andesite. The sequence suggested by the two arcs is consistent with the hypothesis of Green and Ringwood (1966), in which quartz-normative basalt forms in the initial stages of island arc development and parts of the basaltic pile subsequently transform to eclogite and sink into the mantle, where partial melting may result in the development of andesitic magma.—DBV

00878 **Baker, Wallace Hayward.** Mohr–Coulomb strength theory for anisotropic soils [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 29, no. 7, p. 2417B, 1969.

00903 **Bales, William E.; Kulm, L. D.** Structure of the continental shelf off southern Oregon [abs.]: Am. Assoc. Petroleum Geologists Bull., v. 53, no. 2, p. 471–472, 1969.

Bales, William E. *See* Kulm, L. D. 00904

00882 **Bandy, Orville L.; Casey, Richard E.; Wright, Ramil C.** Geologic significance of *Prunopyle titan* Campbell and Clark [abs.]: Am. Assoc. Petroleum Geologists Bull., v. 53, no. 2, p. 467, 1969.

00887 **Bandy, Orville L.; Yen, Meei-Meei; Wright, Ramil C.** Planktonic foraminiferal indices common to Lower Pliocene of southern California and Italy [abs.]: Am. Assoc. Petroleum Geologists Bull., v. 53, no. 2, p. 465–466, 1969.

00892 **Bandy, Orville L.; Wilcoxon, James A.** Correlation of marine Middle Tertiary stages of California with tropical planktonic zones [abs.]: Am. Assoc. Petroleum Geologists Bull., v. 53, no. 2, p. 467–468, 1969.

Banks, Harold. *See* Duncan, John R. 00723

00754 **Banks, Norman G.; Richards, Michael L.** Structure and bathymetry of western end of Bartlett Trough, Caribbean Sea, *in* Tectonic relations of northern Central America and the western Caribbean: Am. Assoc. Petroleum Geologists Mem. 11, p. 221–228, illus., 1969.

The Cayman Ridge bounds Bartlett Trough on the north and appears to end about 100 km from the shelf off British Honduras. A basement high, the Bonacca Ridge, bounds the trough on the south from the Bay Islands to Swan Island. North of Bay Islands, a previously unchartered deep (here named 'Bonacca Deep') lies at the base of the southern escarpment of the trough. Many other ridges, basins, and banks are detected also. New bathymetric and magnetic maps and seismic profiles illustrate the main structural features of the area. No reasonable structural models could be derived. No evidence for large lateral offset parallel with the long axis of the structure has been found, nor is there evidence for subsidence of the central block of a large graben. The trough appears to be a normal oceanic deep flanked by two parallel ridges of continental crust.—*from* Authors' abstract

Barker, Fred. *See* Bickford, M. E. 00986

06967 **Barksdale, Henry C.** Effects of the drought on water resources—surface and subsurface hydrology, *in* Conference on the drought in the northeastern United States, Sterling Forest, N.Y., 1967, Proc.: New York, New York Univ. School Eng. and Sci., Geophys. Research Lab. (TR–68–3), p. 202–217, illus., 1968.

Basic principles of the hydrologic cycle are reviewed with reference to the effect of the 1961–67 drought on the water resources of the northeastern U.S. In this

region, ground water discharges mainly into the stream systems, furnishing 40 to 50 percent of average annual flow; the impact of the drought was not felt until 1965 and 1966 when the water table, normally recharged during the non-growing season, was below normal level at the beginning of the growing season. Much of the drainage area supplying New York City lies in the area where the five-year deficiency amounted to 2.5 years or more of normal runoff. There has not been any shortages of water resources in the Northeast, a water-rich region; the shortage of water supplies (developed resources) have been due to lack of coordinated regional planning for future or emergency supplies.—VMJ

06828 **Barla, G. B.; Wane, M. T.** Stress-relief method in anisotopic rocks by means of gauges applied to the end of a borehole [abs.]: Mining Eng., v. 20, no. 12, p. 45, 1968.

06793 **Barnes, Harley; Poole, Forrest G.** Regional thrust-fault system in Nevada Test Site and vicinity, *in* Nevada Test Site: Geol. Soc. America Mem. 110, p. 233–238, illus., 1968.

Several exposures in this region appear to be remnants of a single major thrust system, its roots probably northwest of Yucca Flat, where a drill hole penetrates Precambrian and Cambrian clastics overlying middle and upper Paleozoic rocks, and a steeply west-dipping reverse fault is suggested. Southeastward, basal rocks of the thrust plate are Middle and Upper Cambrian carbonates, the fault relatively flat. One larger outlier is in the CP Hills, the zone below it locally sheared, folded, and faulted. Six others are distributed for 75 miles along north-trending axes of major synclines, as much as 35 miles southeast of the possible root zone. In Mine Mountain, subsidiary blocks of Devonian and Silurian carbonates, detached from the upper part of an autochthonous block, are thrust southeastward in a wedge over less deformed Carboniferous rocks, with discontinuous segments beneath the CP thrust.—GDC

Barnes, Ivan. *See* O'Neil, James R. 00748

00965 **Barnes, J. A.** Southeast area of Tejon oil field: California Div. Oil and Gas, California Oil Fields—Summ. Operations 1968, v. 54, no. 1, p. 37–44, illus., tables, 1969.

The Southeast area of Tejon oil field is within the Tejon embayment of the Maricopa basin. Strata range from Jurassic basement complex to Holocene alluvium. Structure is a homocline, striking northeasterly and dipping gently to the northwest; to the south the dip steepens markedly, and in the outcrop, the Miocene Tecuya and Eocene Tejon Formations are overturned. Producing zones are the Miocene "upper" and "lower" Reserve zones which are separate both stratigraphically and structurally. Through August 1968 the area had produced a total of 289,560 bbl oil.—MCM

00709 **Barnes, Lawrence G.** Miocene *Desmatophocinae* from California [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 3, 1969.

00913 **Barnes, Peter W.** Bathymetry and sedimentary structures of Santa Cruz basin, California [abs.]: Am. Assoc. Petroleum Geologists Bull., v. 53, no. 2, p. 461–462, 1969.

Barnes, Sarah S. *See* Echols, Ronald J. 00916

06813 **Barosh, Patrick J.** Relationships of explosion-produced fracture patterns to geologic structure in Yucca Flat, Nevada Test Site, *in* Nevada Test Site: Geol. Soc. America Mem. 110, p. 199–217, illus., 1968.

Fractures produced by underground nuclear explosions form expected radial and concentric patterns in overlying alluvium, and are commonly aligned preferentially. Fracture trends unrelated to Yucca fault parallel bedrock joints at the valley edge; the most conspicuous parallel the set of most closely spaced joints. This similarity in trend of fractures and joints may result from differential movement, during explosion, along underlying bedrock joints that parallel those exposed in valley sides.

Fractures above detonations in tuff show a greater degree of preferred orientation than those above detonations in alluvium. Some fractures related to the recently active Yucca fault are en echelon along its trace; others branch from or lie adjacent and nearly parallel to it. One explosion caused vertical displacement of at least 18 inches across main fractures along the fault.—GDC

00677 **Barrows, Allan G.** An inverted, gradational sequence of basic metamorphic rocks along the Scott River, Siskiyou County, California [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 3–4, 1969.

00705 **Barrows, Allan G.** The petrogenesis of an alpine ultramafic complex in the Klamath Mountains, Siskiyou County, California [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 4, 1969.

Barrows, Allan G. *See* Sylvester, A. G. 00792

00932 **Basham, P. W.** Canadian magnitudes of earthquakes and nuclear explosions in south-western North America: Royal Astron. Soc. Geophys. Jour., v. 17, no. 1, p. 1–13, illus., tables, 1969.

Canadian seismograph network mean body-wave and surface-wave magnitudes are computed for 28 earthquakes and 28 nuclear explosions in southwestern North America to test the effectiveness of the surface- vs. body-wave discriminant between earthquakes and explosions for purely continental paths. For the present Canadian network, the magnitude threshold of discrimination is about m 4.5. A comparison is made between these and other (intercontinental) surface- vs. body-wave relationships by normalizing all data to standard magnitudes. Surface-wave attenuation for intercontinental paths limits the effectiveness of the discriminant to magnitudes about 1.0 higher than the same recording techniques can achieve for intracontinental paths.—Author's abstract

00730 **Bass, M. N.; Zartman, R. E.** The basement of Yucatan Peninsula [abs.]: EOS (Am. Geophys. Union Trans.), v. 50, no. 4, p. 313, 1969.

Bass, Manuel N. *See* McBirney, Alexander R. 00765

Bass, Manuel N. *See* McBirney, Alexander R. 00768

00769 **Bass, Manuel N.** Petrography and ages of crystalline basement rocks in Florida—Some extrapolations, *in* Other papers on Florida and British Honduras: Am. Assoc. Petroleum Geologists Mem. 11, p. 283–310, illus., tables, 1969.

The basement rocks are predominantly ignimbrites, tuff, and agglomerate, generally of rhyolitic composition, in which regional metamorphism is not recognized. A granitic province occurs in central Florida, and the rocks are generally altered. Diabase or trachydiabase is known also. Local metamorphism occurs in some greenschist-facies areas. The relation of the ignimbrites to the crystalline rocks is discussed. A metamorphic event about 530 m.y. ago is described from K-Ar and Rb-Sr dates from hornfels, diorite, and other metamorphic rocks. Comparisons with similarly-aged rocks from the west coast of North Africa are made. A left lateral strike slip fault relating the Florida ignimibrites to similar rocks in the Arbuckle and Wichita Mountains in Oklahoma is considered possible but unlikely.—HRC

00923 **Bassinger, B. G.; DeWald, O. E.; Peter, G.** Interpretation of the magnetic anomalies off central California: Jour. Geophys. Research, v. 74, no. 6, p. 1484–1487, illus., 1969.

Magnetic total intensity observations off the coast of California to 133° W. delineate additional offsets of the magnetic anomaly lineations not previously reported. The lack of topographic expression of the minor magnetic anomaly offsets suggests that either the sedimentary cover masks small displacements or the source of the magnetic anomalies lies in the deeper part of the oceanic crust. A distinct change in amplitude, wavelength, and trend of the magnetic lineations occurs at approximately 124°20′ W. This change coincides with a hiatus in the pattern of the magnetic lineations

and supports the contention that the process of sea-floor genesis was episodic rather than a continuous event.—Authors' abstract

Bateman, Paul C. *See* Wones, David R. 00736

06806 **Bath, Gordon D.** Aeromagnetic anomalies related to remanent magnetism in volcanic rock, Nevada Test Site, *in* Nevada Test Site: Geol. Soc. America Mem. 110, p. 135–146, illus., table, 1968.

Studies of many tuffs and lavas show that remanent magnetism is responsible for prominent aeromagnetic anomalies associated with Tertiary volcanic rocks in the Nevada Test Site area. Of 50 volcanic units investigated, only 14 have remanent intensity and thickness required to produce anomalies; 7 are normal giving positive anomalies; 6 are reverse giving negative anomalies; and 1 has normal and reverse magnetization, giving positive and negative anomalies. Remanent directions in rock free from near-surface lightning effects are consistent within stratigraphic units; their polarity measurements are applicable to correlations of exposed units.—*from* Author's abstract

00780 **Beales, F. W.; Oldershaw, A. E.** Evaporite-solution brecciation and Devonian carbonate reservoir porosity in western Canada: Am. Assoc. Petroleum Geologists Bull., v. 53, no. 3, p. 503–512, illus., 1969.

Ephemeral environments in which evaporites may be deposited can develop in reef-bank carbonate complexes. Resulting evaporite-bearing carbonates may develop porosity from solution of evaporites, and if brecciation has occurred before solution, resulting porosity will be of the breccia-interstitial or breccia-moldic varieties. Six criteria are presented for recognizing solution breccias. The Upper Devonian Fairholme Formation of western Alberta, and the Middle Devonian Presqu'ile and Pine Point Dolostones on the south shore of Great Slave Lake were developed as reef-bank carbonate complexes with evaporites. These subsequently developed evaporite-solution breccias that are recognized by the criteria presented. Evaporite-solution porosity may be common in carbonate complexes of the reef-bank origin, and may be areas in which both fluid hydrocarbons and metallic mineral deposits may have accumulated.—SEF

00775 **Behrendt, John C.; Popenoe, Peter.** Basement structure contour map of North Park–Middle Park basin, Colorado: Am. Assoc. Petroleum Geologists Bull., v. 53, no. 3, p. 678–682, illus., 1969.

Geophysical data have enabled construction of a Precambrian basement structure contour map of the North Park–Middle Park basin in northern Colorado. Seismic refraction, gravity, and magnetic data were used with available well control to delineate structural relief ranging from 13,000 feet above sea level in the adjacent mountains to 9,000 feet below sea level in North Park. The Spring Creek normal fault, which trends west-northwest across North Park, has about 6,000 feet of vertical displacement. A structural high, 10–15 mi wide and 6,000-feet amplitude, is present in the basin in southern North Park. Gravity data suggest that several thousand feet of sedimentary rocks underlie the Independence Mountain and Never Summer thrust faults.—Authors' abstract

07082 **Belyea, H. R.; Sanford, B. V.; Hood, P. J.** The Geological Survey of Canada and the oil industry, *in* Dusters and gushers—The Canadian oil and gas industry (J. H. Hilborn and Canadian Petroleum, editors): Toronto, Ontario, Pitt Publishing Co. Ltd., p. 99–104, 1968.

The Geological Survey of Canada has been active since 1842. Geologists of the Survey were among the first to explore the western lands of the Confederation and describe the potential mineral resources. As early as 1908 cuttings from wells were kept. Following expansion of the oil industry after the Leduc discoveries, the Survey expanded also, as its work load increased. The Survey was the first organized unit to investigate the Arctic Archipelago for mineral potential and to produce reconnaissance and topographic maps of all sorts for use by the industry. The concentration of population in the east determined that much of the early work

be done in that area. The Survey now has a geophysics branch which has published numerous geophysical maps of otherwise inaccessible areas.—HRC

00839 **Bender, Margaret M.; Bryson, Reid A.; Baerreis, David A.** University of Wisconsin radiocarbon dates VI: Radiocarbon, v. 11, no. 1, p. 228–235, 1969.

Radiocarbon dates obtained since December 1967 are included in this list. Archeologic samples are from Wisconsin, Iowa, Illinois, and Oklahoma. Collection and dating of fossil organic material for the study of Canadian paleoenvironments continues with the object of further delineating by palynology and stratigraphy the extent and nature of vegetational and climatic changes already established in central and northern Canada. Geologic samples are from Alberta, Manitoba, and Northwest Territories.—MCM

00858 **Benson, Paul Harrison, 3d.** The depositional environment of the Upper Cretaceous Black Creek Formation in North and South Carolina [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 29, no. 7, p. 2491B, 1969.

00896 **Bereskin, S. Robert.** Miocene biostratigraphy of southwestern Santa Cruz Island, California [abs.]: Am. Assoc. Petroleum Geologists Bull., v. 53, no. 2, p. 469, 1969.

07009 **Berg, Dennis W.; Duane, David B.** Effect of particle size and distribution on stability of artificially filled beach, Presque Isle Peninsula, Pennsylvania, *in* Conf. on Great Lakes research, 11th, Milwaukee, Wis., 1968, Proc.: Ann Arbor, Mich., Internat. Assoc. Great Lakes Research, p. 161–178, illus., tables, 1968.

Presque Isle Peninsula, a sandy spit on the south shore of Lake Erie, has experienced continued erosion of its lakeward shoreline, although for nearly 150 years numerous structures have been built to stabilize the Peninsula and halt its natural eastward migration. In 1965, about 1.27×10^4 cu m of sand fill, coarser than the fill previously used and coarser than the original natural beach sand, was placed on a section of the beach. Analysis of the data from subsequent annual surveys indicates that the test area has undergone minimal material loss and has maintained a relatively stable profile. It is judged that definite shore stabilization occurs, with benefits such as reduced nourishment requirements, from utilization of sand fill with size characteristics superior to those of original sand on an eroding beach.—*from* Authors' abstract

00828 **Berg, Orville Roger.** Cherokee Group, west flank of the Nemaha Ridge, north-central Oklahoma: Shale Shaker, v. 19, no. 6, p. 94–110, illus., 1969.

The study area is on the northern shelf of the Anadarko basin. A total of 820 electric logs and 30 sample logs were used to construct cross sections for each east-west row of townships (20) and a north-south section for each column of townships (10). From these, isolith and isopach maps of the five genetic increments demarcated by marker beds—Brown-Undifferentiated, Bartlesville, Red Fork, Skinner, and Prue—were made. The Cherokee-Marmaton appears to conform to the definition of genetic sequence of strata. The Krebs and Cabaniss Groups have been included in the Cherokee; the Cherokee base could not be determined. Division between the Cherokee and Marmaton Groups is placed at the base of the Big Lime-Oswego limestone sequence. An isopach and lapout map of the Cherokee and pre-Cherokee Groups is given also.—ESL

00952 **Bergendahl, M. H.** Geologic map and sections of the southwest quarter of the Dillon quadrangle, Eagle and Summit Counties, Colorado: U.S. Geol. Survey Misc. Geol. Inv. Map I-563, scale 1:24,000, 1969.

00823 **Berger, Rainer; Libby, W. F.** UCLA radiocarbon dates IX: Radiocarbon, v. 11, no. 1, p. 194–209, 1969.

Measurements reported have been carried out during the first half of 1968 as a continuation of UCLA date lists I through VIII (1962–68). Archeologic samples are from California, New Mexico, Mexico, North Borneo, Afghanistan, Africa, France, and England. Climatologic, geochemical, and geologic samples are from

California, British Columbia, Ireland, Panama, Mexico, and the Pacific Ocean. Atmospheric measurements were made at China Lake, Calif.—MCM

00894 **Berger, Wolfgang H.** Anaerobic basin sedimentation and differential preservation of planktonic Foraminifera [abs.]: Am. Assoc. Petroleum Geologists Bull., v. 53, no. 2, p. 468–469, 1969.

00706 **Berkland, James O.** Late Mesozoic and Tertiary sequence near the proposed Garrett Tunnel, Mendocino and Lake Counties, California [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 4–5, 1969.

Bernard, Claude. *See* Laverdière, Camille. 07002

00707 **Bezore, Stephen P.** The Mount Saint Helena ultramafic–mafic complex of the northern California Coast Ranges [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 5–6, 1969.

00986 **Bickford, M. E.; Wetherill, G. W.; Barker, Fred; Lee-Hu, Chin-Nan.** Precambrian Rb–Sr chronology in the Needle Mountains, southwestern Colorado: Jour. Geophys. Research, v. 74, no. 6, p. 1660–1676, illus., tables, geol. map, 1969.

The Precambrian rocks of the Needle Mountains, southwestern Colorado, have undergone two major cycles of sedimentation, metamorphism, and igneous intrusion. The later events of the first cycle include intrusion of the post-kinematic Tenmile granite 1720±50 m.y. ago, granite of Bakers Bridge 1711±80 m.y. ago, and Whitehead granite 1675±74 m.y. ago. Erosion, deposition of the Uncompahgre formation, folding, and low-to-intermediate rank metamorphism took place in the interval 1675–1466 m.y., followed by post-kinematic intrusion of the Eolus granite and the granite of Florida River 1466±27 m.y. ago and of the gabbro of Electra Lake 1454±50 m.y. ago. The last known Precambrian event was the intrusion of the stock of Trimble granite and of rhyolite porphyry dikes 1350±50 m.y. ago.—*from* Authors' abstract

Bickford, M. E. *See* Mose, Douglas, G. 00987

Bidwell, L. E. *See* Oakes, E. L. 07058

Biesecker, J. E. *See* Cobb, Ernest D. 00716

00762 **Birman, Joseph H.** Geothermal exploration for ground water: Geol. Soc. America Bull., v. 80, no. 4, p. 617–630, illus., tables, 1969.

Ground-temperature measurements at shallow depth can be related to the occurrence of ground water. Shallow, moving ground water produces low temperatures and low annual drift rates, due to damping of the annual temperature wave. Dry, shallow bedrock produces reverse effects. A case study in Johnson Valley, southern California, is described.—AG

00708 **Bishop, Richard C.** Early Miocene selachian faunas from Kern County, California [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 6, 1969.

06901 **Bjork, Philip R.; Goldberg, Paul S.; Kesling, Robert V.** Mouth frame of the ophiuroid *Onychaster*: Michigan Univ. Mus. Paleontology Contr., v. 22, no. 4, p. 45–60, illus., tables, 1968.

The three species of *Onychaster* [*flexilis, barrisi, strimplei*, Mississippian, central U.S.] can be readily distinguished by the configuration and arrangement of plates composing the mouth frame. No phylogenetic trends are apparent.—Authors' abstract

00827 **Black, Robert F.** Glacial geology of Northern Kettle Moraine State Forest, Wisconsin: Wisconsin Acad. Sci., Arts and Letters Trans., v. 57, p. 99–119, illus., 1969.

The State Forest, in eastern Wisconsin, is an irregular area about 22 miles long and 1 to 4 miles wide that includes a northern portion of the world-famous Kettle Interlobate Moraine, which was formerly a drainageway marking the SSW-trending surface junction between the Green Bay and Lake Michigan ice lobes of late Woodfordian (Cary) age. In this area, the drainageway is a marked depression floored with stratified clastics; from the center, numerous moulin kames rise abruptly, and from the flanks project many crevasse fills, eskers, kames, and other stagnant-ice features that constitute end moraines of the two lobes. The larger kettles—depressions from the melting of buried ice blocks—are now occupied by ponds. Abrupt bends in the interlobate moraine seem related to bedrock topography and local direction of ice movement of the opposing lobes.—VMJ

00909 **Blackerby, Bruce A.** Miocene volcanics of western Santa Monica Mountains, California [abs.]: Am. Assoc. Petroleum Geologists Bull., v. 53, no. 2, p. 460, 1969.

Blake, David W. *See* Theodore, Ted G. 00796

00678 **Blake, M. C., Jr.; Cotton, William M.** Inverted metamorphic mineral zones in Franciscan metagraywacke of the Diablo Range, northern California [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 6–7, 1969.

Blake, W., Jr. *See* Lowdon, J. A. 00833

07010 **Blake, Wilson.** Finite element model study of slope modification at the Kimbley Pit: Soc. Mining Engineers Trans., v. 241, no. 4, p. 525–533, illus., 1968.

A mathematical model based on the finite element method of stress analysis has been used to describe the behavior of the western wall of Kimbley Pit [Ely, Nev.] as its slope was steepened from 45° to 57°. Theoretical stress changes because of slope modification are slight except at the toe of the modified slope. Magnitudes of stress created are small when compared with the strength of a competent rock. Resulting displacement patterns point out the need for determining the in-situ state of stress at a site prior to excavation or modification. A comparison of model results with field measurements shows that, in general, the model has described the measured behavior of the west wall of the Kimbley Pit remarkably well.—Author's abstract

00679 **Blank, H. Richard; McKee, Edwin H.** Chemical variations and K-Ar ages of volcanic rocks in the Bull Valley district, Utah [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 7, 1969.

Blumer, Max. *See* Cooper, W. J. 07059

00888 **Boettcher, Richard S.; Fowler, Gerald A.** Foraminiferal trends in Oregon sublittoral [abs.]: Am. Assoc. Petroleum Geologists Bull., v. 53, no. 2, p. 466, 1969.

00695 **Boggs, Sam, Jr.** Distribution of gold by size and grade in the Sixes River, southwestern Oregon [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 7–8, 1966.

Bohnenberger, Otto. *See* Dengo, Gabriel. 00770

07063 **Bombolakis, E. G.** Photoelastic study of initial stages of brittle fracture in compression: Tectonophysics, v. 6, no. 6, p. 461–473, illus., 1968.

Initial stages of crack growth within various arrays of elongate open flaws were studied in photoelastic models subjected to uniaxial compression. Growth of inclined flaws into stable configuration with respect to stress for crack growth, with certain exceptions, is similar to that described previously (Bombolakis, 1964). Characteristic features of the first and second stages are occurrences of small 'shocks' and minor drops in applied stress that causes crack growth. In subsequent stages crack growth was gradual and could be controlled by loading. These results suggest a possible mechanism for some seismic events associated with shallow-focus earthquakes. Tests indicate that initial stages of crack growth depend in a remarkable way on the past history of deformation.—*from* Author's abstract

06829 **Bond, L. O.; Schmidt, A. W.; Alger, R. P.** Electric log applications in coal mining and rock mechanics [abs.]: Mining Eng., v. 20, no. 12, p. 46, 1968.

00885 **Bonham-Carter, Graeme F.** Computer simulation of nearshore sediment transport [abs.]: Am. Assoc. Petroleum Geologists Bull., v. 53, no. 2, p. 465, 1969.

06830 **Bonini, W. E.** Use of gravity anomalies in prediction of the shape of intrusive bodies [abs.]: Mining Eng., v. 20, no. 12, p. 57–58, 1968.

00859 **Bonnichsen, Bill.** General geology and petrology of the metamorphosed Biwabik Iron Formation, Dunka River area, Minnesota [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 29, no. 7, p. 2492B, 1969.

07066 **Boone, Peter A.** Stratigraphy of the basal Trinity (Lower Cretaceous) sands of central Texas: Baylor Geol. Studies Bull. 15, 64 p., illus., 1968.

A wedge of clastic sediments thickens downdip and becomes interbedded with carbonate rocks. The carbonate-bearing facies can be subdivided into three units, only the lower two of which can be identified in the updip terrestrial rocks. Deposition was controlled by uplift in the source area. The basal Trinity sands were deposited upon the Wichita paleoplain, an erosional surface on Paleozoic rocks. Divides on the paleoplain funneled clastic material to the depositional area and valleys acted as basins for the thickest sediment accumulations where they were drowned by the Comanchean sea. Many of the valleys and divides on the paleoplain are named and described.—HRC

06831 **Bostick, N. H.** Electronic data processing applied to uranium resource prediction and exploration [abs.]: Mining Eng., v. 20, no. 12, p. 63, 1968.

Bostrom, R. C. *See* Vali, V. 07055

Bowsher, Arthur Leroy. *See* Cocke, J. M. 06800

06978 **Boyle, R. W.** Fahlbands, sulfide schists, and ore deposition: Econ. Geology, v. 63, no. 7, p. 835–838, tables, 1968.

Features common to the fahlbands or sulfide schists of Norway, the Canadian Shield, and the Paleozoic of Canada include concordance with the associated argillaceous and siliceous rocks, high carbon content representing original sapropelic material, enrichment in elements associated with life processes (K,P,S, and C), and metal contents (Au,Ag,Pb,Zn,Cu,Mo,As,Sb) many times larger than in ordinary shales. They may, themselves, be ore bodies, or may be the source of metals and metalloids later trapped in other receptacle rocks or structures.—WSW

Bradshaw, R. Lewis. *See* McClain, William C. 06850

00969 **Brady, B. T.** A statistical theory of brittle fracture for rock materials—Pt. 1, Brittle failure under homogeneous axisymmetric states of stress: Internat. Jour. Rock Mechanics and Mining Sci., v. 6, no. 1, p. 21–42, illus., 1969.

A criterion of brittle fracture is formulated for rock materials displaying a tight pore structure. It is assumed that total fracture occurs when the average value of the total volumetric microcrack strain attains a critical value. The results and conclusions of the analysis are compared with existing theories of brittle fracture.—Author's abstract

Brandau, B. L. *See* Rona, E. 00978

06867 **Brawner, Carroll O.** The three major problems in rock slope stability in Canada [abs.]: Mining Eng., v. 20, no. 8, p. 25–26, 1968.

Brethauer, G. E. *See* McKeown, F. A. 00729

00742 **Brett, Robin.** The earth's core—Speculations on its chemical equilibrium with the mantle [abs.]: EOS (Am. Geophys. Union Trans.), v. 50, no. 4, p. 332, 1969.

07007 **Brezonik, Patrick Lee.** Application of mathematical models to the eutrophication process, *in* Conf. on Great Lakes research, 11th, Milwaukee, Wis., 1968, Proc.: Ann Arbor, Mich., Internat. Assoc. Great Lakes Research, p. 16–30, illus., tables, 1968.

The trophic state of a lacustrine ecosystem is maintained by complex interactions between many habitats, resources and organisms. The interactions between the variables are difficult to identify and quantify by laboratory and field studies alone. However, valuable insight into ecosystem processes can be obtained by formulating simple mathematical models to simulate ecosystem behavior on digital or analog computers. For example, the process of nutrient enrichment of lakes, eutrophication, can be described as a simple function of net nitrogen and phosphorus input rates. Several types of dynamic models simulating eutrophication are discussed. A simple single ecosystem model for nitrogen cycling in a lake is described.—*from* Author's abstract

06956 **Brockamp, B.; Pistor, P.** Ein Beitrag zur seismischen Erforschung der Struktur des grönlandischen Inlandeises [with English abs.]: Polarforschung 1967, v. 6, pt. 37, nos. 1–2, p. 133–146, illus., 1968.

Information is gained about the physical properties of the upper layers of Greenland's inland ice from the records of reflection seismic shooting. The influence of individual sources of errors on results can be estimated. Two attempts are made for the theoretical description of the v(z)–curves. The thickness of the firn layer can be given with sufficient accuracy. The traveltime plan for the central Greenland ice cap shows a good correlation with the facies map given by Benson. The layers as given by seismic investigations differ from those found by glaciological methods in most cases. The accuracy of the measurements is, however, not sufficient. Authors' abstract

00741 **Brookins, D. G.; Stewart, D. B.; Chaudhuri, S.** Comparison of the Rb/Sr ages of the Thorofare Andesite and Vinalhaven Rhyolite with the Castin Volcanics, Penobscot Bay, Maine [abs.]: EOS (Am. Geophys. Union Trans.), v. 50, no. 4, p. 331, 1969.

06974 **Brookins, Douglas G.** Rb–Sr and K–Ar age determinations from the Precambrian rocks of the Jardine–Crevice Mountain area, southwestern Montana: Earth Sci. Bull., v. 1, no. 2, p. 5–9, illus., tables, 1968.

Rb–Sr whole–rock studies of the Precambrian rocks of this area show that the Jardine–Crevice Mountain granite intruded older metasediments at about 2.66±0.08 b.y. ago. The metasediments may be as old as 3.3 b.y. The Crevice Mountain granite exhibits some foliation. K–Ar age studies on minerals from a whole–rock sample indicate a strong thermal metamorphism at about 1.6 to 1.8 b.y. A Rb–Sr feldspar–whole rock isochron yields a date of 1.85 b.y., but muscoite from the same rock yields an older age. It is suggested that the 1.6–1.8 b.y. metamorphic event was of sufficient strength to drive off radiogenic Ar–40 accumulated until that time, but too weak to completely re–equilibrate the radiogenic Sr–87 isotopes.—*from* Author's abstract

00777 **Brooks, F. Ellis.** Angelina Rose Messina (1910–1968): Am. Assoc. Petroleum Geologists Bull., v. 53, no. 3, p. 694–695, portrait, 1969.

07042 **Brown, D. A.; Phillips, R. E.; Ashlock, L. O.; Fuqua, B. D.** Effect of Al^{3+} and H^{+} upon the simultaneous diffusion of ^{85}Sr and ^{86}Rb in kaolinite clay [with French, German, and Russian abs.]: Clays and Clay Minerals, v. 16, no. 2, p. 137–146, illus., table, 1968.

Measurements were made in salt–free aliquots of clay having different Al:H ratios. Self–diffusion of Sr and Rb was measured at 4, 24, 48 and 75°C. Rb diffusion was not significantly altered as Al^{3+} increased from 12 to 52 percent. The faster diffusing Rb ion has a greater energy of activation than Sr(4.8–3.6 kcal/mole), however the Arrhenius frequency factor for Rb (a measure of the probability of ion exchange) was much greater for Rb than Sr (28.8 and 0.4×10^{-4} respectively). Altering the Rb and Sr saturation and the complementary ions resulted in changes

in the diffusivity, the energy of activation, and the frequency factor for these ions, but not always in the same direction or to the same degree.—*from* Authors' abstract

06952 **Brown, P. E.** Igneous rocks of the Kialineq area, East Greenland [abs.]: Geol. Soc. London Proc. 1968, no. 1649, p. 106, discussion, 1968.

06832 **Brown, Severn P.** Ore, refolds, and three-dimensions [abs.]: Mining Eng., v. 20, no. 12, p. 63, 1968.

06802 **Bryant, Laurie J.** A new genus of mustelid from the Ellensburg Formation, Washington: Los Angeles County Mus. Contr. Sci., no. 139, 6 p., illus., tables, 1968.

Beckia grangerensis, n. gen. and sp., is the second reported genus of mellivorine mustelids from the Pliocene of North America. Probably representative of an Asian emigrant, the type specimen was found [in the Granger Clay pit, Yakima County, Wash.] in association with remains of other late Clarendonian animals, including horse and camel. The jaw is that of an animal about the size of a modern wolverine, showing similarities to both *Mellivora* and *Eomellivora*.—Author's abstract

Bryant, William R. *See* Kornicker, Louis S. 00766

Bryson, Reid A. *See* Bender, Margaret M. 00839

00834 **Buckley, James D.; Willis, Eric H.** ISOTOPES' radiocarbon measurements VII: Radiocarbon, v. 11, no. 1, p. 53–105, 1969.

The list presents dates on a portion of samples measured during 1967 and 1968 and measurements made previously for which either complete sample data has been recently received, or, in some cases, deferred due to the editorial load in preparing the definitive list. Geologic samples are from various parts of the world including western, eastern, and central United States, Canada, and the Bahamas. Archeologic samples included specimens from western, eastern, and central United States, Alaska, Ontario, Lesser Antilles, and Mexico.—MCM

Bunce, Elizabeth T. *See* Chase, Richard L. 00928

Bunker, Carl M. *See* Lachenbruch, Arthur H. 00732

Bur, Thomas R. *See* Thill, Richard E. 00937

00696 **Burchfiel, B. C.; Davis, Gregory A.** A kinematic analysis of the Clark Mountain thrust complex, southeastern California [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 8, 1969.

00847 **Burke, J. J.** An antiacodont from the Green River Eocene of Utah: Kirtlandia, no. 5, 7 p., illus., 1969.

Report is made of a new occurrence of the dichobunid artiodactyl genus *Antiacodon* following its discovery in the Green River Formation in northeastern Utah by the Cleveland Museum of Natural History field pary in 1967. A right ramus of the lower jaw with P_4, M_{1-3} is described and identified as *Antiacodon pygmaeus* (Cope).—Author's abstract

Burkhalter, P. G. *See* Campbell, W. J. 06833

Byerlee, James D. *See* Peselnick, Louis. 00735

Byers, F. M., Jr. *See* Noble, Donald C. 06808

Byers, F. M., Jr. *See* Orkild, Paul P. 06815

06816 **Byers, F. M., Jr.; Orkild, Paul P.; Carr, W. J.; Quinlivan, W. D.** Timber Mountain Tuff, southern Nevada, and its relation to cauldron subsidence, *in* Nevada Test Site: Geol. Soc. America Mem. 110, p. 87–97, illus., 1968.

The Timber Mountain Tuff consists of three Pliocene ash-flow sheets, K-Ar dated about 11 m.y., distributed symmetrically about the 18-by-20-mile Timber Mountain caldera. Lithologically, petrographically, and chemically similar, they have small but consistent petrographic differences. The oldest, Rainier Mesa Member, mostly predates major collapse of the caldera, and extends eastward 35 mi and westward 50 mi over 3,200 sq mi, with initial volume more than 285 cm mi. Relations of the other two sheets are not clear. Partially filling the caldera and overlapping its walls, the Ammonia Tank MS Member, initially 180 cu mi, outside overlies and is coextensive with the Rainier Mesa. The Cat Canyon sheet is restricted to the central resurgent dome within the caldera; at least 3,000 feet is known, initial volume estimated at 50 cu mi, presumably burying the Rainier Mesa.—GDC

Byrd, W. J. *See* Langenheim, R. L., Jr. 00657

06951 **Caldwell, R. E.; Dantzman, C. L.** A morphological and genetic study of some fine-textured soils of West Florida—[Pt.] 2, Magnolia and Greenville: Soil and Crop Sci. Soc. Florida Proc. 1967, v. 27, p. 190–203, illus., tables, 1968.

A study of two Magnolia and four Greenville soils was made to determine physical, chemical, and mineralogical characteristics; and to evaluate the strength of the dominant soil-forming process. Stratification studies were made to help designate the horizons; and complete profile descriptions of each soil are given. Analyses include particle size distribution, soil reaction, cation exchange capacity, and organic matter determinations. Clays were separated from selected A, B, and C horizons of each profile and percentages of SiO_2, Fe_2O_3, Al_2O_3, TiO_2, Ca, Mg, K, and ignition losses reported. Cation exchange capacity values and mineral identification are included. Silica-alumina and silica sesquioxide ratios indicate podzolization was more dominant than latosolation in the Magnolia; but in the Greenville, latosolation was slightly more dominant.—*from* Authors' abstract

Caldwell, R. E. *See* Dantzman, C. L. 06964

00835 **Callow, W. J.; Hassall, Geraldine I.** National Physical Laboratory radiocarbon measurements VI: Radiocarbon, v. 11, no. 1, p. 130–136, 1969.

This list contains measurements made since those reported in NPL V(1968) on geologic samples from England, Australia, Canada, and Malaysia.—MCM

00697 **Campbell, D. G.** Geologic investigation of the Rancho Seco Nuclear Generating Station, California [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 9, 1969.

06975 **Campbell, F. A.; Williams, K. L.** Composition of sphalerite from Quemont mine, Quebec: Econ. Geology, v. 63, no. 7, p. 824–831, illus., tables, 1968.

Microprobe analyses of ore samples suggest equilibrium on the microscale of individual polished sections. Sphalerite with pyrite and pyrrhotite ranged from 8.9 to 13.3 mole percent FeS, with pronounced mode at 11–12 percent. Sphalerite with pyrite alone had larger range of 2.7–13.7 percent and same mode. This modal composition is in better accord with Barton and Toulmin's (1966) extrapolation of the curve for the composition of sphalerite in equilibrium with pyrite-pyrrhotite than with the experimental results of others.—WSW

06833 **Campbell, W. J.; Burkhalter, P. G.; Marr, G. E., 3d.** Ore evaluation by portable X-ray analyzers and drillhole probes [abs.]: Mining Eng., v. 20, no. 12, p. 47, 1968.

00993 **Canada Geological Survey.** Aeromagnetic series, English Brook, Manitoba: Canada Geol. Survey Geophysics Paper 4097, scale 1:63,360, 1969.

00994 **Canada Geological Survey.** Aeromagnetic series, Shallow Lake, Manitoba: Canada Geol. Survey Geophysics Paper 4098, scale 1:63,360, 1969.

00995 **Canada Geological Survey.** Aeromagnetic series, Hecla Island, Manitoba: Canada Geol. Survey Geophysics Paper 4121, scale 1:63,360, 1969.

00996 **Canada Geological Survey.** Aeromagnetic series, Anderson Point, Manitoba: Canada Geol. Survey Geophysics Paper 4122, scale 1:63,360, 1969.

00997 **Canada Geological Survey.** Aeromagnetic series, Bull Head, Manitoba: Canada Geol. Survey Geophysics Paper 4223, scale 1:63,360, 1969.

00998 **Canada Geological Survey.** Aeromagnetic series, Bradbury River, Manitoba: Canada Geol. Survey Geophysics Paper 4124, scale 1:63,360, 1969.

00999 **Canada Geological Survey.** Aeromagnetic series, Sheet 63 A/2, Manitoba: Canada Geol. Survey Geophysics Paper 4125, scale 1:63,360, 1969.

01000 **Canada Geological Survey.** Aeromagnetic series, Shorncliffe, Manitoba: Canada Geol. Survey Geophysics Paper 4145, scale 1:63,360, 1969.

01001 **Canada Geological Survey.** Aeromagnetic series, Koostatak, Manitoba: Canada Geol. Survey Geophysics Paper 4146, scale 1:63,360, 1969.

01002 **Canada Geological Survey.** Aeromagnetic series, Moose Islands, Manitoba: Canada Geol. Survey Geophysics Paper 4147, scale 1:63,360, 1969.

01003 **Canada Geological Survey.** Aeromagnetic series, Jackhead Lake, Manitoba: Canada Geol. Survey Geophysics Paper 4148, scale 1:63,360, 1969.

01004 **Canada Geological Survey.** Aeromagnetic series, Commissioner Island, Manitoba: Canada Geol. Survey Geophysics Paper 4149, scale 1:63,360, 1969.

01005 **Canada Geological Survey.** Aeromagnetic series, Berens River, Manitoba: Canada Geol. Survey Geophysics Paper 4150, scale 1:63,360, 1969.

01006 **Canada Geological Survey.** Aeromagnetic series, Mossy Point, Manitoba: Canada Geol. Survey Geophysics Paper 4151, scale 1:63,360, 1969.

01007 **Canada Geological Survey.** Aeromagnetic series, Marchand Creek, Manitoba: Canada Geol. Survey Geophysics Paper 4152, scale 1:63,360, 1969.

01008 **Canada Geological Survey.** Aeromagnetic series, Sheet 63 H/6, Manitoba: Canada Geol. Survey Geophysics Paper 4154, scale 1:63,360, 1969.

01009 **Canada Geological Survey.** Aeromagnetic series, Costes Lake, Manitoba: Canada Geol. Survey Geophysics Paper 4156, scale 1:63,360, 1969.

01010 **Canada Geological Survey.** Aeromagnetic series, Hodgson, Manitoba: Canada Geol. Survey Geophysics Paper 4165, scale 1:63,360, 1969.

01011 **Canada Geological Survey.** Aeromagnetic series, Harwill, Manitoba: Canada Geol. Survey Geophysics Paper 4166, scale 1:63,360, 1969.

01012 **Canada Geological Survey.** Aeromagnetic series, Sheet 62 P/12, Manitoba: Canada Geol. Survey Geophysics Paper 4167, scale 1:63,360, 1969.

01013 **Canada Geological Survey.** Aeromagnetic series, Sturgeon Bay, Manitoba: Canada Geol. Survey Geophysics Paper 4168, scale 1:63,360, 1969.

01014 **Canada Geological Survey.** Aeromagnetic series, Lynx Bay, Manitoba: Canada Geol. Survey Geophysics Paper 4169, scale 1:63,360, 1969.

01015 **Canada Geological Survey.** Aeromagnetic series, Reindeer Island East, Manitoba: Canada Geol. Survey Geophysics Paper 4170, scale 1:63,360, 1969.

01016 **Canada Geological Surey.** Aeromagnetic series, Sheet 63 A/12, Manitoba: Canada Geol. Survey Geophysics Paper 4171, scale 1:63,360, 1969.

01017 **Canada Geological Survey.** Aeromagnetic series, George Islands, Manitoba: Canada Geol. Survey Geophysics Paper 4172, scale 1:63,360, 1969.

01018 **Canada Geological Survey.** Aeromagnetic series, Sheet 63 H/4, Manitoba: Canada Geol. Survey Geophysics Paper 4173, scale 1:63,360, 1969.

01019 **Canada Geological Survey.** Aeromagnetic series, Belanger Point, Manitoba: Canada Geol. Survey Geophysics Paper 4174, scale 1:63,360, 1969.

01020 **Canada Geological Survey.** Aeromagnetic series, Warren Landing, Manitoba: Canada Geol. Survey Geophysics Paper 4175, scale 1:63,360, 1969.

01021 **Canada Geological Survey.** Aeromagnetic series, Norway House, Manitoba: Canada Geol. Survey Geophysics Paper 4176, scale 1:63,360, 1969.

01022 **Canada Geological Survey.** Aeromagnetic series, Clark Point, Manitoba: Canada Geol. Survey Geophysics Paper 4185, scale 1:63,360, 1969.

01023 **Canada Geological Survey.** Aeromagnetic series, Reindeer Island West, Manitoba: Canada Geol. Survey Geophysics Paper 4186, scale 1:63,360, 1969.

01024 **Canada Geological Survey.** Aeromagnetic series, Sheets 63 B/9 and 63 B/16, Manitoba: Canada Geol. Survey Geophysics Papers 4187–4188, scale 1:63,360, 1969.

01025 **Canada Geological Survey.** Aeromagnetic series, Sheets 63 G/1, 63 G/8, 63 G/9, Manitoba: Canada Geol. Survey Geophysics Papers 4189–4191, scale 1:63,360, 1969.

01026 **Canada Geological Survey.** Aeromagnetic series, Playgreen Lake, Manitoba: Canada Geol. Survey Geophysics Paper 4192, scale 1:63,360, 1969.

01027 **Canada Geological Survey.** Aeromagnetic series, Sheet 63 B/2, Manitoba: Canada Geol. Survey Geophysics Paper 4201, scale 1:63,360, 1969.

01028 **Canada Geological Survey.** Aeromagnetic series, Reedy Lake, Manitoba: Canada Geol. Survey Geophysics Paper 4202, scale 1:63,360, 1969.

01029 **Canada Geological Survey.** Aeromagnetic series, Sheet 63 B/10, Manitoba: Canada Geol. Survey Geophysics Paper 4203, scale 1:63,360, 1969.

01030 **Canada Geological Survey.** Aeromagnetic series, Wicked Point, Manitoba: Canada Geol. Survey Geophysics Paper 4204, scale 1:63,360, 1969.

01031 **Canada Geological Survey.** Aeromagnetic series, Long Point, Manitoba: Canada Geol. Survey Geophysics Paper 4205, scale 1:63,360, 1969.

01032 **Canada Geological Survey.** Aeromagnetic series, Sheet 63 G/7, Manitoba: Canada Geol. Survey Geophysics Paper 4206, scale 1:63,360, 1969.

01033 **Canada Geological Survey.** Aeromagnetic series, Eagle Island, Manitoba: Canada Geol. Survey Geophysics Paper 4207, scale 1:63,360, 1969.

01034 **Canada Geological Survey.** Aeromagnetic series, Limestone Bay, Manitoba: Canada Geol. Survey Geophysics Paper 4208, scale 1:63,360, 1969.

01035 **Canada Geological Survey.** Aeromagnetic series, Sheet 63 B/3, Manitoba: Canada Geol. Survey Geophysics Paper 4214, scale 1:63,360, 1969.

01036 **Canada Geological Survey.** Aeromagnetic series, Chitek Lake, Manitoba: Canada Geol. Survey Geophysics Paper 4215, scale 1:63,360, 1969.

01037 **Canada Geological Survey.** Aeromagnetic series, Sisib Lake, Manitoba: Canada Geol. Survey Geophysics Paper 4216, scale 1:63,360, 1969.

01038 **Canada Geological Survey.** Aeromagnetic series, Katimik Lake, Manitoba: Canada Geol. Survey Geophysics Paper 4217, scale 1:63,360, 1969.

01039 **Canada Geological Survey.** Aeromagnetic series, Grand Rapids, Manitoba: Canada Geol. Survey Geophysics Paper 4218, scale 1:63,360, 1969.

01040 **Canada Geological Survey.** Aeromagnetic series, Selkirk Island, Manitoba: Canada Geol. Survey Geophysics Paper 4219, scale 1:63,360, 1969.

01041 **Canada Geological Survey.** Aeromagnetic series, Howell Point, Manitoba: Canada Geol. Survey Geophysics Paper 4220, scale 1:63,360, 1969.

01042 **Canada Geological Survey.** Aeromagnetic series, William Lake, Manitoba: Canada Geol. Survey Geophysics Paper 4221, scale 1:63,360, 1969.

01043 **Canada Geological Survey.** Aeromagnetic series, Waterhen Lake North, Manitoba: Canada Geol. Survey Geophysics Paper 4226, scale 1:63,360, 1969.

01044 **Canada Geological Survey.** Aeromagnetic series, Birch Island, Manitoba: Canada Geol. Survey Geophysics Paper 4227, scale 1:63,360, 1969.

01045 **Canada Geological Survey.** Aeromagnetic series, Point Laronde, Manitoba: Canada Geol. Survey Geophysics Paper 4228, scale 1:63,360, 1969.

01046 **Canada Geological Survey.** Aeromagnetic series, Denbeigh Point, Manitoba: Canada Geol. Survey Geophysics Paper 4229, scale 1:63,360, 1969.

01047 **Canada Geological Survey.** Aeromagnetic series, Napanee Bay, Manitoba: Canada Geol. Survey Geophysics Paper 4230, scale 1:63,360, 1969.

01048 **Canada Geological Survey.** Aeromagnetic series, Norris Lake, Manitoba: Canada Geol. Survey Geophysics Paper 4231, scale 1:63,360, 1969.

01049 **Canada Geological Survey.** Aeromagnetic series, Sheet 63 G/12, Manitoba: Canada Geol. Survey Geophysics Paper 4232, scale 1:63,360, 1969.

01050 **Canada Geological Survey.** Aeromagnetic series, Davidson Lake, Manitoba: Canada Geol. Survey Geophysics Paper 4233, scale 1:63,360, 1969.

01051 **Canada Geological Survey.** Aeromagnetic series, Pelican Bay, Manitoba: Canada Geol. Survey Geophysics Paper 4239, scale 1:63,360, 1969.

01052 **Canada Geological Survey.** Aeromagnetic series, Mossy Portage, Manitoba: Canada Geol. Survey Geophysics Paper 4240, scale 1:63,360, 1969

01053 **Canada Geological Survey.** Aeromagnetic series, Crossing Island, Manitoba: Canada Geol. Survey Geophysics Paper 4241, scale 1:63,360, 1969.

01054 **Canada Geological Survey.** Aeromagnetic series, Nason Point, Manitoba: Canada Geol. Survey Geophysics Paper 4246, scale 1:63,360, 1969.

01055 **Canada Geological Survey.** Aeromagnetic series, Spruce Island, Manitoba: Canada Geol. Survey Geophysics Paper 4247, scale 1:63,360, 1969.

01056 **Canada Geological Survey.** Aeromagnetic series, Barrows, Manitoba: Canada Geol. Survey Geophysics Paper 4251, scale 1:63,360, 1969.

01057 **Canada Geological Survey.** Aeromagnetic series, Dawson Bay, Manitoba: Canada Geol. Survey Geophysics Paper 4252, scale 1:63,360, 1969.

07096 **Canada Geological Survey.** Aeromagnetic series, Einarson Creek, Yukon Territory: Canada Geol. Survey Geophysics Paper 4340, scale 1:63,360, 1968.

07097 **Canada Geological Survey.** Aeromagnetic series, Sheet 105 O/12, Yukon Territory: Canada Geol. Survey Geophysics Paper 4341, scale 1:63,360, 1968.

07098 **Canada Geological Survey.** Aeromagnetic series, Emerald Creek, Yukon Territory: Canada Geol. Survey Geophysics Paper 4342, scale 1:63,360, 1968.

07099 **Canada Geological Survey.** Aeromagnetic series, Sheets 105 O/4 and 105 O/3, Yukon Territory: Canada Geol. Survey Geophysics Papers 4343–4344, scale 1:63,360, 1968.

07101 **Canada Geological Survey.** Aeromagnetic series, Arrowhead Lake, Yukon Territory: Canada Geol. Survey Geophysics Paper 4346, scale 1:63,360, 1968.

07102 **Canada Geological Survey.** Aeromagnetic series, Marmot Creek, Yukon Territory: Canada Geol. Survey Geophysics Paper 4347, scale 1:63,360, 1968.

07103 **Canada Geological Survey.** Aeromagnetic series, Sheets 105 O/15, 105 O/10, 105 O/7, and 105 O/2, Yukon Territory: Canada Geol. Survey Geophysics Papers 4348–4351, scale 1:63,360, 1968.

07104 **Canada Geological Survey.** Aeromagnetic series, Sheet 105 O/1, Yukon Territory, Northwest Territories: Canada Geol. Survey Geophysics Paper 4360, scale 1:63,360, 1968.

07105 **Canada Geological Survey.** Aeromagnetic series, Keele Peak, Yukon Territory, Northwest Territories: Canada Geol. Survey Geophysics Paper 4361, scale 1:63,360, 1968.

07106 **Canada Geological Survey.** Aeromagnetic series, Sheets 105 O/9 and 105 O/16, Yukon Territory, Northwest Territories: Canada Geol. Survey Geophysics Papers 4370–4371, scale 1:63,360, 1968.

07107 **Canada Geological Survey.** Aeromagnetic series, Tenas Creek, Yukon Territory: Canada Geol. Survey Geophysics Paper 4380, scale 1:63,360, 1968.

07108 **Canada Geological Survey.** Aeromagnetic series, Blind Lakes, Yukon Territory: Canada Geol. Survey Geophysics Paper 4381, scale 1:63,360, 1968.

07109 **Canada Geological Survey.** Aeromagnetic series, Laforce Lake, Yukon Territory: Canada Geol. Survey Geophysics Paper 4382, scale 1:63,360, 1968.

07110 **Canada Geological Survey.** Aeromagnetic series, Mount Selous, Yukon Territory: Canada Geol. Survey Geophysics Paper 4383, scale 1:63,360, 1968.

07111 **Canada Geological Survey.** Aeromagnetic series, Marjorie Lake, Yukon Territory: Canada Geol. Survey Geophysics Paper 4388, scale 1:63,360, 1968.

07112 **Canada Geological Survey.** Aeromagnetic series, Sheets 105 J/5, 105 J/12, 105 J/13, and 105 J/3, Yukon Territory: Canada Geol. Survey Geophysics Papers 4389–4392, scale 1:63,360, 1968.

07113 **Canada Geological Survey.** Aeromagnetic series, Jackfish Lake, Yukon Territory: Canada Geol. Survey Geophysics Paper 4393, scale 1:63,360, 1968.

07114 **Canada Geological Survey.** Aeromagnetic series, Sheldon Lake, Yukon Territory: Canada Geol. Survey Geophysics Paper 4394, scale 1:63,360, 1968.

07115 **Canada Geological Survey.** Aeromagnetic series, Sheets 105 J/14, 105 J/2, 105 J/7, 105 J/10, and 105 J/15, Yukon Territory: Canada Geol. Survey Geophysics Paper 4395–4399, scale 1:63,360, 1968.

07116 **Canada Geological Survey.** Aeromagnetic series, Pelly Lakes, Yukon Territory: Canada Geol. Survey Geophysics Paper 4400, scale 1:63,360, 1968.

07117 **Canada Geological Survey.** Aeromagnetic series, Wolf Canyon, Yukon Territory: Canada Geol. Survey Geophysics Paper 4401, scale 1:63,360, 1968.

07118 **Canada Geological Survey.** Aeromagnetic series, Sheet 105 J/9, Yukon Territory: Canada Geol. Survey Geophysics Paper 4402, scale 1:63,360, 1968.

07119 **Canada Geological Survey.** Aeromagnetic series, Itsi Lakes, Yukon Territory: Canada Geol. Survey Geophysics Paper 4403, scale 1:63,360, 1968.

07120 **Canada Geological Survey.** Aeromagnetic series, Polar continental shelf, Sheets 98 G/SW, 98 G/NW, 99 B/SW, 99 B/NW, District of Franklin, Northwest Territories: Canada Geol. Survey Geophysics Papers 5406–5409, scale 1:126,720, 1968.

07121 **Canada Geological Survey.** Aeromagnetic series, Polar continental shelf, Sheets 108 E/NE, 108 H/SE, and 108 H/NE, District of Franklin, Northwest Territories: Canada Geol. Survey Geophysics Papers 5410–5412, scale 1:126,720, 1968.

07122 **Canada Geological Survey.** Aeromagnetic series, Polar continental shelf, Sheets 109 A/SE, 109 A/NE, 109 D/SE, District of Franklin, Northwest Territories: Canada Geol. Survey Geophysics Papers 5413–5415, scale 1:126,720, 1968.

07123 **Canada Geological Survey.** Aeromagnetic series, Polar continental shelf, Sheets 108 E/NW, 108 H/SW, 108 H/NW, District of Franklin, Northwest Territories: Canada Geol. Survey Geophysics Papers 5416–5418, scale 1:126,720, 1968.

07124 **Canada Geological Survey.** Aeromagnetic series, Polar continental shelf, Sheets 109 A/SW, 109 A/NW, 109 D/SW, District of Franklin, Northwest Territories: Canada Geol. Survey Geophysics Papers 5419–5421, scale 1:126,720, 1968.

07125 **Canada Geological Survey.** Aeromagnetic series, Polar continental shelf, Sheets 108 F/NE, 108 G/SE, 108 G/NE, District of Franklin, Northwest Territories: Canada Geol. Survey Geophysics Papers 5422–5424, scale 1:126,720, 1968.

07126 **Canada Geological Survey.** Aeromagnetic series, Polar continental shelf, Sheets 109 B/SE, 109 B/NE, 109 C/SE, District of Franklin, Northwest Territories: Canada Geol. Survey Geophysics Papers 5425–5427, scale 1:126,720, 1968.

07127 **Canada Geological Survey.** Aeromagnetic series, Polar continental shelf, Sheets 108 F/NW, 108 G/SW, 108 G/NW, District of Franklin, Northwest Territories: Canada Geol. Survey Geophysics Papers 5428–5430, scale 1:126,720, 1968.

07128 **Canada Geological Survey.** Aeromagnetic series, Polar continental shelf, Sheets 109 B/SW, 109 B/NW, 109 C/SW, District of Franklin, Northwest Territories: Canada Geol. Survey Geophysics Papers 5431–5433, scale 1:126,720, 1968.

Canadian Petroleum. *See* Hilborn, James D. 07079

06868 **Cannon, R. S.; Pierce, A. P.** Lead isotope variations in the Mississippi Valley lead–zinc districts [abs.]: Mining Eng., v. 20, no. 8, p. 25, 1968.

Cannon, Richard W. *See* Rychkun, Edward A. 06884

06869 **Carmichael, V. W.** Simple air–photo techniques pare North American's exploration and mining costs [abs.]: Mining Eng., v. 20, no. 8, p. 27, 1968.

06834 **Carpenter, R. H.; Robinson, G. D.** Primary dispersion haloes associated with zinc mineralization in east Tennessee [abs.]: Mining Eng., v. 20, no. 12, p. 47, 1968.

07001 **Carr, Jerome B.** When did mantle convection cease?: Tectonophysics, v. 6, no. 5, p. 413–424, table, 1968.

Evidence is discussed indicating that convection has not operated under the Atlantic for 900 m.y. This is extended to the entire upper mantle as a minimum age for lack of upper mantle convection; possibly convective processes ceased before continents began their growth 3800 m.y. ago. If convection is operational at all today it is limited to depths below 1000 km by the nature of the C–region. This concept implies that continued sampling of ocean sediments will reveal older and older sediments, mid–ocean ridges are due to phase change at depth, convection for geosyncline development is not tectonically acceptable if it ceased 900 m.y. ago,

isotopic analysis of Precambrian basement of North America will not match that of Africa, and phase change should be investigated as the source of tectonic energy.—VSN

Carr, W. J. *See* Byers, F. M., Jr. 06816

06817 **Carr, W. J.; Quinlivan, W. D.** Structure of Timber Mountain resurgent dome, Nevada Test Site, *in* Nevada Test Site: Geol. Soc. America Mem. 110, p. 99–108, illus., 1968.

Timber Mountain, a 9-by-7-mile structural dome, elongated northwesterly, produced by resurgence of magma beneath the caldera center, is composed of tuff of the Cat Canyon ash-flows that accumulate only within the collapsed caldera. Dips on the dome are mostly gentle outward, but steepen locally to as much as 65°; highest uplift is at least 4,000 feet. Marginal arcuate faults and later longitudinal and radial graben system are dominant structures. The arcuate system may reflect reactivated inner edge of a pre-existing caldera ring fracture; it is exposed only in the southeast quadrant, where intruded by granite porphyry, basalt, rhyolite, and silicic tuff dikes. A semicircular graben near the dome center developed concurrently with other grabens. Several small rhyolite intrusives along longitudinal faults are analogous to the 'middle rhyolite' of the Valles caldera.—GDC

06819 **Carroll, Roderick D.** Applications of inhole geophysical logs in volcanic rocks, Nevada Test Site, *in* Nevada Test Site: Geol. Soc. America Mem. 110, p. 125–134, illus., 1968.

Electric logs are the major qualitative tool in determining lithologic contacts in volcanic rocks at the Nevada Test Site. In one drill hole, only the electric log, of several geophysical logs, indicates the presence of the contact between an ash-flow tuff and a rhyolite. Acoustic logging devices, however, are most useful in the quantitative determination of rock properties. A relationship exists between sonic velocity and rock porosity in these volcanic rocks. Acoustic logs using full-wave recording techniques indicate that shear and Young's modulus values are related to rock velocity. Consequently, it may be possible to determine many of the engineering physical properties of certain rock types by using only a sonic log.—Author's abstract

00899 **Carter, Melvan D.** (and others). Applications of continuous reflection parameter determination [abs.]: Am. Assoc. Petroleum Geologists Bull., v. 53, no. 2, p. 470, 1969.

Carter, N. L. *See* Raleigh, C. B. 00734

00698 **Carver, G. A.; Slemmons, D. B.; Glass, C. E.** Surface faulting patterns in Owens Valley, California [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 9–10, 1969.

Casey, Richard E. *See* Bandy, Orville L. 00882

00845 **Cashion, W. B.** Geologic map of the Black Cabin Gulch quadrangle, Rio Blanco County, Colorado: U.S. Geol. Survey Geol. Quad. Map GQ-812, scale 1:24,000, section, 1969.

Caswell, W. W. *See* Pollock, S. J. 00757

Cathles, Lawrence M. *See* Phinney, Robert A. 00991

00755 **Cebulski, Donald E.** Foraminiferal populations and faunas in barrier-reef tract and lagoon, British Honduras, *in* Other papers on Florida and British Honduras: Am. Assoc. Petroleum Geologists Mem. 11, p. 311–328, illus., 1969.

Analysis of foraminiferal faunas in 89 sediment samples from the barrier reef and lagoon of British Honduras showed that the largest living and total foraminiferal populations are on the leeward side of mangrove and coral-sand cays in the reef tract, and in the lagoon near the mouths of rivers. The living Foraminifera were

divided into barrier-reef tract and lagoon faunas, reflecting the two major environments of the area. The reef-tract fauna was divided further into the main-reef, reef-margin, and reef-channel assemblages. Temperature and salinity measurements of 41 bottom-water samples indicated a decrease in temperature and an increase in salinity from the mainland toward the barrier reef.—Author's abstract

06835 **Cederstrom, D. J.** Hydrologic effects due to strip mining west of the Appalachians [abs.]: Mining Eng., v. 20, no. 12, p. 59, 1968.

00860 **Centini, Barry Austin.** Structural geology of the Hanging Rock area, Stokes County, North Carolina [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 29, no. 7, p. 2492B, 1969.

06933 **Chagnon, Jean-Y.** Les coulées d'argile dans la province de Québec [with English abs.], *in* Éditions spéciales du centenaire, 1868-1968—Sciences de la terre: Naturaliste Canadien, v. 95, no. 6, p. 1327-1343, illus., tables, 1968.

Landslides of the mud-flow type are common in the province of Québec. The results of an inventory of the flows are presented and discussed briefly. The nature of the flows and of the clay is studied and it is shown that the mineralogy, chemistry and structure of the marine clays are important factors and that they have a direct bearing upon the physical and mechanical properties. A short review of the causes of mudflows shows their large number. As a consequence, the means of preventing them are also numerous.—Author's abstract

00699 **Chakrabarti, A. K.** Fabric analyses by X-ray diffractometer [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 10, 1969.

06970 **Chamberlain, Von Del.** Meteorites of Michigan: Michigan Geol. Survey Bull. 5, 42 p., illus., 1968.

By way of introduction to the fascinating subject of meteorites, the author describes the dramatic sights and sounds accompanying two recent spectacular fireballs in the Great Lakes region. The reader is also taken on an imaginary journey with a meteorite in its fiery flight through the atmosphere. Meteorites are among the rarest mineral objects found on Earth. Details on eight specimens found in Michigan are also provided. Many interesting accounts by actual observers are related and commented upon. A convenient glossary of terms and a list of references complete this booklet.—Author's abstract

07031 **Chase, Edith Becker; Payne, Faith N.** (compilers). Selected techniques in water resources investigations, 1966-67: U.S. Geol. Survey Water-Supply Paper 1892, 164 p., illus., tables, 1968.

The report contains 27 papers by 31 authors, three of which are cited separately. Subjects covered include dye-tracing, water quality, sampling, water-level, evaporation and rainfall, river velocities, flood frequency data, and geophysical logging methods.—ESL

00928 **Chase, Richard L.; Bunce, Elizabeth T.** Underthrusting of the eastern margin of the Antilles by the floor of the western North Atlantic Ocean, and origin of Barbados ridge: Jour. Geophys. Research, v. 74, no. 6, p. 1413-1420, illus., 1969.

The evidence from recent reflection profiles across the southwestern end of the Puerto Rico trench and eastern margin of the north end of the Barbados ridge is compatible with seismological and magnetic evidence that suggests that the ocean floor is spreading west from the Mid-Atlantic Ridge and is being thrust westward beneath the Antilles. The Barbados ridge is composed of sedimentary material that formerly formed a continental rise overlying the oceanic crust along the northern margin of South America. Thrusting of oceanic crust beneath the Lesser Antilles arc and displacement of South America westward relative to the Antilles during the Cenozoic resulted in crumpling, thickening, and accumulation of the material of the continental rise in front (east) of the Antilles arc to form the Barbados ridge.—*from* Authors' abstract

Chastain, Charlette. *See* Nayudu, Y. R. 00638

Chaudhuri, S. *See* Brookins, D. G. 00741

07092 **Chawla, V. K.; Traversy, W. J.** Methods of analyses on Great Lakes waters, *in* Conf. on Great Lakes research, 11th, Milwaukee, Wis., 1968, Proc.: Ann Arbor, Mich., Internat. Assoc. Great Lakes Research, p. 524–530, table, 1968.

Methods of the Analytical Section, Water Quality Division, were used to analyse Great Lakes waters aboard ship on Lake Erie and at the shore based laboratory, Burlington, Ontario where both Lake Erie and Lake Ontario waters were analysed. Lake Erie samples were analysed aboard ship for pH, turbidity, dissolved oxygen, biochemical oxygen demand, specific conductance, silica, nitrate and orthophosphate. The analyses carried out on shore included sulphate, chloride, alkalinity, calcium, magnesium, sodium, potassium, fluoride and many heavy metals. This paper discusses some techniques and limitations, particularly, for determining orthophosphate aboard ship. It tabulates the methods used for determining each parameter and shows the precision for these methods obtained on shore.—Authors' abstract

Chawla, V. K. *See* Weiler, R. R. 07094

06979 **Chernyshev, L. V.; Anfilogov, V. N.** Subsolidus phase relations in the ZnS–FeS–FeS_2 system [discussion of paper by R. S. Boorman, 1967]: Econ. Geology, v. 63, no. 7, p. 841–844, illus., table, 1968.

Phase relations in the system Fe–Zn–S have been studied by hydrothermal synthesis, which permits investigation at lower temperatures than dry methods. Results for the composition of sphalerite in equilibrium with pyrite and pyrrhotite suggest that FeS content increases with decreasing temperature to more than 30 mol percent at 200°C. This result is at variance with the conclusions from experimental work by others (Boorman, ibid., v. 62, p. 614–631, 1967).—WSW

00849 **Chopra, Anil K.** Hydrodynamic pressures on dams during earthquakes—Closure [to discussion of paper 5695, 1967]: Am. Soc. Civil Engineers Proc., v. 95, paper 6371, Jour. Eng. Mechanics Div., no. EM 1, p. 312–315, illus., 1969.

Results of a recent investigation, since publication of the paper [ibid., v. 93, no. EM6, p. 205–223, 1967], of the importance of interaction between dam and reservoir are given; the response of the selected reservoir–dam system subjected to the S21W component of the Taft earthquake, 1952, is computed, presented in figures, and described. Results demonstrate that it is necessary to include this interaction in analyzing the response of concrete gravity dams to earthquakes.—ESL

Christensen, M. N. *See* Gilbert, C. M. 00690

Christie, James C. *See* Ross, John V. 00811

Christie, John M. *See* Theodore, Ted G. 00797

Churkin, Michael, Jr. *See* Ovenshine, A. Thomas. 00634

00956 **Chute, Newton E.** Bedrock geologic map of the Blue Hills quadrangle, Norfolk, Suffolk, and Plymouth Counties, Massachusetts: U.S. Geol. Survey Geol. Quad. Map GQ–796, scale 1:24,000, section, text, 1969.

Oldest igneous rocks of Blue Hills quadrangle are Precambrian(?) Salem Gabbro–Diorite, Newburyport(?) Quartz Diorite, Dedham Granodiorite, and Westwood Granite. Cambrian sedimentary rocks are quartzite and Braintree Argillite, overlain by six Ordovician(?) formations from Sharon Syenite to Blue Hill Granite Porphyry. Devonian or Carboniferous formations are diabase of Babel Rock, Roxbury Conglomerate, and Cambridge Argillite. The Pennsylvanian is represented by Pondville Conglomerate and the Wamsutta Formations. Diabase dikes of three ages are widely distributed. Folding and faulting occurred during the Appalachian

orogeny late in Paleozoic. Low grade regional metamorphism accompanied diastrophism.—MCM

07078 **Clark, Joan R.; Appleman, Daniel E.; Papike, J. J.** Bonding in eight ordered clinopyroxenes isostructural with diopside: Contr. Mineralogy and Petrology, v. 20, no. 1, p. 81–85, illus., table, 1968.

Bond distances and angles in isostructural, ordered clinopyroxenes are compared for eight compositions, based on five new and three published crystal-structure refinements from X-ray diffraction data. Unit-cell parameters and configuration of the silicate chains are directly correlated with cation composition and distribution in the M2 and M1 sites.—Authors' abstract

07057 **Clark, Lorin D.; Miller, Fred K.** Preliminary geologic map of the Chewelah Mountain quadrangle, Stevens County, Washington: Washington Div. Mines and Geology Geol. Map GM-5, 2 sheets, scale 1:62,500, sections, separate text, 1968.

The Chewelah Mountain quadrangle is underlain by folded, faulted, and regionally metamorphosed sedimentary and volcanic Precambrian rocks (Belt Series and Deer Trail Group), folded and faulted Cambrian quartzite and Paleozoic(?) carbonate rocks, and intermediate Mesozoic(?) plutonic rocks. Bedrock is exposed in upland areas, but more than half the area is concealed by glacial deposits. The complicated structure of layered rocks results from successive deformations ranging from Precambrian to late Paleozoic, Mesozoic, and possibly to Cenozoic. Almost all mining activity is in the southern third of the quadrangle and within two miles of the Flowery Trail Granodiorite. Resources are copper, silver, lead, some molybdenum, sand and gravel, and carbonate rock. Sheet 2 is a geologic map of mines in the Eagle Mountain area.—MCM

00701 **Clark, M. M.; Grantz, Arthur.** Geologic effects of the Borrego Mountain, southern California, earthquake of April 9, 1968 [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 11, 1969.

00826 **Clarke, James W.; Heron, S. Duncan; Furbish, William J.; Baker, Naydean.** Directory of geological research in the Southeast: Southeastern Geology Spec. Pub. 2, 86 p., 1969.

This directory has been compiled as part of a program for offering the opportunity to geologists of the Southeast to coordinate the planning of their research. The listing was assembled from inquiries circulated during the spring and summer of 1968. The status of projects is indicated as: almost complete, active, just beginning, and inactive.—*from* Authors' introduction

06954 **Claus, George.** Studies on terrestrial contaminants of meteorites: New York Acad. Sci. Annals, v. 147, art. 9, p. 365–409, illus., tables, 1968.

Past attempts to find traces of extraterrestrial life, and methods used for proving biogenic and indigenous natures of chemical moeties or microstructure are reviewed. Possible ways of contamination and types of contaminants to be expected are discussed. In present experiments, untreated samples and bromo-ethanol density gradient separated fractions were cultured, and of the 3,780 cultures only 2.13 percent showed growth. Meteorite extract did not support growth, and it was proved that bacteria would not penetrate meteorite fragments. The weight of contaminants per gram of meteorite was generally 10^{-10}, indicating that most organic matter in carbonaceous chondrites is indigenous. Ultrathin sections of intact meteorites for electron microscopy offer the best hope. If a particle embedded in the undisturbed matrix showed morphologies attesting to its biogenic origin, the intactness of the matrix would certify its indigenous nature.—ESL

00726 **Claus, Prodehl.** Crustal structure of the central part of the western United States from seismic-refraction measurements [abs.]: EOS (Am. Geophys. Union Trans.), v. 50, no. 4, p. 239, 1969.

Cleland, N. A. *See* Sproule, J. C. 07056

00758 **Cloos, Ernst.** Reply [to discussion by Peter Coney (1969) of "Experimental analysis of Gulf Coast fracture patterns", 1968]: Am. Assoc. Petroleum Geologists Bull., v. 53, no. 2, p. 435–436, 1969.

Tectonic denudation is not a problem in the Gulf Coast region and neither scale of extension nor structures suggest that Appalachian-type folding is present. Normal strike faults may provide necessary extension rather than denudation.—SEF

00716 **Cobb, Ernest D.; Biesecker, J. E.** The National Hydrologic Bench-Mark Network [abs.]: EOS (Am. Geophys. Union Trans.), v. 50, no. 4, p. 146, 1969.

00975 **Cobban, William A.** The Late Cretaceous ammonites *Scaphites leei* Reeside and *Scaphites hippocrepis* (DeKay) in the western interior of the United States: U.S. Geol. Survey Prof. Paper 619, 29 p., illus., tables, 1969.

Scaphites leei Reeside and *S. hippocrepis* (DeKay) are closely related ammonites found at many localities in the western interior region. Both species occur in dimorphic pairs which are interpreted as male and female. The females differ from the males by attaining a larger size, by possessing an umbilical swelling, and by minor differences in ornamentation. Each species can be separated into three chronological subspecies to which Roman numerals I, II, and III are assigned.—WAC

06800 **Cocke, J. M.; Bowsher, Arthur Leroy.** New tabulate genus *Sutherlandia* (Coelenterata, Anthozoa) from Pennsylvanian of Oklahoma and Kansas: Kansas Univ. Paleont. Contr.—Paper 33, 8 p., illus., 1968.

Small tabulate corals assigned to *Sutherlandia* Cocke and Bowsher, n.gen., are described from Desmoinesian and Missourian (Pennsylvanian) rocks of Kansas and Oklahoma. The genus comprises squamulae-bearing tabulates with distal processes and mural pores. It presently includes six species previously assigned to *Pseudofavosites* Gerth, 1921, and three new species. Shapes of coralla depend on attachment surfaces; spherical forms circumscribe cylindrical objects; hemispherical and irregular forms usually encrust planar surfaces.—Authors' abstract

00702 **Colburn, Ivan P.** Mount Diablo, California—Basic intrusion or basement diapir? [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 11–12, 1969.

06836 **Colburn, William A.** Deep wells, earthquakes and common sense—The Rocky Mountain Arsenal waste disposal problem [abs.]: Mining Eng., v. 20, no. 12, p. 60, 1968.

Coleman, R. G. *See* Loney, R. A. 00643

00703 **Coleman, Robert G.; Peterman, Zell E.** Colebrooke Schist of southwestern Oregon [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 12–13, table, 1969.

06949 **Collinson, James W.** Permian and Triassic biostratigraphy of the Medicine Range, northeastern Nevada: Earth Sci. Bull., v. 1, no. 4, p. 25–44, illus., geol. map, 1968.

In a 6,500-ft sequence exposed in south-central Elko County, Permian rocks include the Riepetown, Pequop, and Loray formations of the Arcturus Group; and the Kaibab, Plympton, and Gerster formations of the Park City Group. Triassic strata are represented by the Thaynes Formation. The succession of faunas and lithologies in the Pequop and Loray formations demonstrates a gradual regression from open marine to very shallow and brackish or hypersaline deposits. Fusulinid limestones at the base of the Pequop in the northern Medicine Range grade southward to shallow-water silty deposits. The Thaynes Formation is interpreted as part of a transgressive sequence deposited by a westward advancing sea; a basal conglomerate overlies the Gerster on a disconformity with several feet of relief. Conodonts and ammonites are useful in correlating its biostratigraphic units.—*from* Author's abstract

Colton, Roger B. *See* Fernald, Arthur T. 06825

07083 **Connell, Gordon A.** Oil and natural gas reserves, *in* Dusters and gushers—The Canadian oil and gas industry (J. H. Hilborn and Canadian Petroleum, editors): Toronto, Ontario, Pitt Publishing Co. Ltd., p. 143–151, illus., tables, 1968.

Reserves in Canada are usually calculated on proved and probable bases. Proved are those which will be recovered with reasonable certainty; probable reserves are proved plus an estimate of additional reserves recoverable ultimately as a result of extensions to existing pools. Over ten billion bbls of crude oil are probable and over one billion more of liquid natural gas still remain. Over 50 million cubic feet of natural gas remain probable, and over 100 million long tons of sulfur still remain in reserve.—HRC

06969 **Connelly, Thomas L.** Discovering the Appalachians—Chap. 2, The ancient land: Harrisburg, Pa., Stackpole Books, p. 26–36, illus., 1968.

The main range, sometimes called Older Appalachians, extends from Maine to Georgia; west of it a newer range, usually known as the Allegheny Mts., extends from southern New York to Alabama. There are a number of cross ranges at right angles to the main ranges. Topics covered in relating the geology are: how the mountains were formed, the sculpturing action of ice in the northern part, and of water in the central and southern, antecedent streams, water and wind gaps, stream piracy, and waterfalls. The remainder of the book is a sight-seeing guide.—ESL

00884 **Conomos, T. J.** Processes affecting distribution and dispersal of suspended matter in Columbia River effluent system [abs.]: Am. Assoc. Petroleum Geologists Bull., v. 53, no. 2, p. 464, 1969.

00883 **Cook, David O.** Sand transport in region of shoaling waves [abs.]: Am. Assoc. Petroleum Geologists Bull., v. 53, no. 2, p. 464–465, 1969.

06870 **Cooksley, James W.** Seismic methods applied to investigations of overburden problems [abs.]: Mining Eng., v. 20, no. 8, p. 28A, 1968.

00959 **Cooley, M. E.; Harshbarger, J. W.; Akers, J. P.; Hardt, W. F.** Regional hydrogeology of the Navajo and Hopi Indian Reservations, Arizona, New Mexico, and Utah, *with a section on* Vegetation by O. N. Hicks: U.S. Geol. Survey Prof. Paper 521-A, p. A1–A61, illus., tables, geol. map, 1969.

The stratigraphy, structure, climate, vegetation, and drainage history of the Navajo and Hopi Indian Reservations are reviewed as a basis for examination of the regional hydrogeology. Aquifers are sandstone between nearly impermeable layers of siltstone and mudstone which confine water under artesian pressure; main aquifers are Coconino and Navajo Sandstones and alluvium. Basins and uplifts control water movement, and the larger folds divide the area into five hydrologic basins: Black Mesa, San Juan, Blanding, Henry, and Kaiparowits basins. Main recharge areas are the Defiance Plateau, Zuni Mts., Mogollon Slope, San Francisco Plateau, Navajo Uplands; movement of ground water in each is downdip toward the Colorado, Little Colorado, or San Juan Rivers. The ground water shows a wide range in type and amount of dissolved constituents.—VSN

00879 **Coon, Richard Floyd.** Correlation of engineering behavior with the classification of in-situ rock [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 29, no. 7, p. 2419B, 1969.

Cooper, Susan C. *See* Harman, Robert A. 00889

07059 **Cooper, W. J.; Blumer, Max.** Linear, *iso* and *anteiso* fatty acids in Recent sediments of the North Atlantic: Deep-Sea Research, v. 15, no. 5, p. 535–540, tables, 1968.

Straight chain, *iso*- and *anteiso*-acids from three different sedimentary environments of the North Atlantic have been isolated and resolved by gas chromatography.

The acids cover the range from C_7 to C_{21}. Normal and *iso*-acids occur at every carbon number; *Anteiso*-acids occur only at odd carbon numbers within the same range. It is suggested that the *iso*- and *anteiso*-acids may provide markers for the bacterial contribution, and isoprenoid acids markers for the contribution of animal lipids to the organic matter of Recent sediments.—Authors' abstract

Cope, Joseph H. *See* Roberts, W. L. 06893

Cope, Joseph R. *See* Fredlund, Daniel A. 06994

Corchary, George S. *See* Fernald, Arthur T. 06825

Cotton, William M. *See* Blake, M. C., Jr. 00678

Courtright, T. R. *See* Pierce, R. W. 00816

00704 **Cowan, Darrel S.; Mansfield, Charles P.** Serpentinite flows on Joaquin Ridge, southern Coast Ranges, California [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 13, 1969.

Craib, K. E. *See* Lintz, Joseph, Jr. 00661

Creasy, John W. *See* Noble, Donald C. 00641

06889 **Crooks, Thomas J.** Water losses and gains across the Pahasapa Limestone, Box Elder Creek, Black Hills, South Dakota: South Dakota Acad. Sci. Proc. 1968, v. 47, p. 49–55, illus., 1968.

The creek has a drainage area of about 100 sq mi above the point where it starts across the outcrop of the cavernous Pahasapa Limestone. Varying volumes of water alternately disappear into sinkholes along the stream and reappear downstream from caverns or apparently from the gravel stream bed. Monthly discharge profiles made from measurements at selected points along the creek show that the net water loss across the outcrop ranges from the entire flow when less than 15 cfs up to 43 cfs when the initial flow is more than that. When the stream is high it appears to have access to loss areas above the normal level. Very close connections between sinks and springs are indicated.—*from* Author's abstract

Crooks, Thomas J. *See* Gries, John Paul. 06890

00943 **Crowder, Robert E.** Cheviot Hills oil field: California Div. Oil and Gas, California Oil Fields—Summ. Operations 1968, v. 54, no. 1, p. 17–22, illus., tables, 1969.

Cheviot Hills is one of several oil fields just south of the easterly trending Malibu-Raymond Avenue–San Gabriel frontal fault system, along which the Santa Monica and San Gabriel Mts. were uplifted; it lies within a wedge formed by these two regional fault systems which probably intersect northwest of the field. Formations penetrated range from the middle Miocene Topanga Formation to Holocene sand and gravel. Important producing zones are the lower Pliocene Repetto Formation, productive only at the eastern end, and the Miocene "B", productive over the entire field, although some oil is obtained also from a deeper zone in the upper portion of the Topanga Formation. Production in 1967 was about 19 million bbls oil and about 118 million Mcf gas.—MCM

Curray, J. R. *See* Winterer, E. L. 07061

00778 **Curtis, Bruce F.** Warren O. Thompson (1898–1968): Am. Assoc. Petroleum Geologists Bull., v. 53, no. 3, p. 695–696, portrait, 1969.

06983 **Dahill, Murray P.** Iron Creek oil field: Earth Sci. Bull., v. 1, no. 2, p. 17–23, illus., 1968.

Iron Creek field, 20 miles southwest of Casper, Wyo., discovered in 1917, was the first to produce gas from the Lower Cretaceous Muddy sandstone. It supplied

Casper until 1923 when pressure was no longer adequate. In 1943, and again in 1965, oil production was established from shallow sands of the Frontier formation in this field, on one of a series of "en-echelon" anticlinal folds on the west flank of the Casper Arch. Oil accumulated as a result of both structural and stratigraphic traps. Due to the complex faulting at depth and the limited control, production may be established in the future from such deeper horizons as the Tensleep sandstone (Pennsylvanian).—GDC

06921 **Daily, Fay Kenoyer.** Edgar Roscoe Cumings [1874–1967]: Indiana Acad. Sci. Proc., 1967, v. 77, p. 38–40, portrait, 1968.

00680 **Dalzell, Bonnie Brooks.** Characters of the pelvis in cursorial mammals [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 13–14, 1969.

Damon, P. E. *See* Grey, D. C. 00831

00946 **Dampney, C. N. G.** The equivalent source technique: Geophysics, v. 34, no. 1, p. 39–53, illus., table, 1969.

The inherent ambiguity of potential field interpretation can be put to advantage. Bouguer anomaly measurements on an irregular grid and at a variety of elevations can be synthesized by an equivalent source of discrete point masses on a plane of arbitrary depth below the surface. By keeping the depth of the plane within certain limits relative to the station spacing, we can ensure that the synthesized field closely approximates the true gravity field in the region close to and above the terrain. Once the equivalent source is obtained, the projection of the Bouguer anomaly onto a regularly gridded horizontal plane is easily done. In addition, the equivalent source can then be economically used to carry out vertical continuation. The technique is illustrated by a hypothetical example and a case history of a local gravity survey in precipitous topography.—Author's abstract

00691 **Danner, Wilbert R.** Glacial-cut groove and glacial-eroded surfaces on serpentine, Fidalgo Island, Washington [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 14, 1969.

00692 **Danner, Wilbert R.** Pleistocene stratigraphy and sedimentary structures at the southeastern side of Point Roberts, Washington [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 14, 1969.

Dantzman, C. L. *See* Caldwell, R. E. 06951

06964 **Dantzman, C. L.; Caldwell, R. E.** A morphological and genetic study of some fine-textured soils of West Florida—[Pt.] 1, Marlboro and Faceville: Soil and Crop Sci. Soc. Florida Proc. 1967, v. 27, p. 177–189, illus., tables, 1968.

The study of a typical Marlboro and two Faceville soils was made to determine physical, chemical, and mineralogical characteristics; and to evaluate the strength of the dominant soil-forming process. Stratification studies were made to help designate the horizons; complete profile descriptions of each soil are given. Analyses include particle size distribution, pH, cation exchange capacity, and organic matter determination. Clays were separated from selected A, B, and C horizons of each profile and percentages of SiO_2, Fe_2O_3, Al_2O_3, TiO_2, Ca, Mg, K, and ignition losses reported. Cation exchange capacity values and mineral identification are included. Silica-alumina and silica sesquioxide ratios indicate that in these soils podzolization was slightly more dominant than latosolation.—*from* Authors' abstract

07045 **Das, Salil K.; Smith, Edgar D.** Fatty acids in fossil algae of different geologic ages: New York Acad. Sci. Annals, v. 147, art. 10, p. 413–418, tables, 1968.

Lipids and fatty acids have been recovered from six fossil algae ranging from Cambrian to Holocene in age. The youngest fossil had an appreciably higher lipid and fatty acid content than the older algae. Qualitatively, the fatty acid content was quite similar to modern algae, but there were some significant quantitative differences noted. The C-16 and C-18 saturated fatty acid content was much higher

than in modern algae, and the C–16 and C–18 unsaturated fatty acid content was correspondingly reduced. This suggests that there might have been a reducing environment, and that the relative amount of saturated and unsaturated fatty acid in fossil algae lipid samples might be used for dating.—*from* Authors' abstract

Davey, R. K. *See* Adams, B. W. 06865

Davis, Gregory A. *See* Burchfiel, B. C. 00696

Davis, L. K. *See* Roddy, D. J. 00725

Davis, W. E. *See* Mabey, D. R. 06848

Decker, Robert W. *See* Melson, William G. 00746

06944 **DeGeoffroy, J.; Wu, S. M.; Heins, R. W.** Selection of drilling targets from geochemical data in the southwest Wisconsin zinc area: Econ. Geology, v. 63, no. 7, p. 787–795, illus., tables, 1968.

Forty targets representing only 1.6 percent of the 500 sq mi covered by a spring-sampling survey were identified by an analytical scheme based on calculation of trend, anomaly, and residual components of the "zinc surface." Commercial zinc mineralization was found in 3 of the 5 targets drilled to date.—WSW

06837 **deLaguna, Wallace.** Disposal of medium-level radioactive waste by hydraulic fracturing [abs.]: Mining Eng., v. 20, no. 12, p. 60, 1968.

00770 **Dengo, Gabriel; Bohnenberger, Otto.** Structural development of northern Central America, *in* Tectonic relations of northern Central America and the western Caribbean: Am. Assoc. Petroleum Geologists Mem. 11, p. 203–220, illus., 1969.

A pre-Pennsylvanian geosyncline was deformed, intruded, metamorphosed, and during Pennsylvanian–Permian time received clastic sediments. Late Permian to Early Triassic folding resulted in land emergence and longitudinal faults marking the beginning of Bartlett Trough and Cayman Ridge. Jurassic and Cretaceous deposition occurred next, in the Mexican geosyncline, and these sediments were deformed and intruded during the Late Cretaceous and early Tertiary, along with intrusive activity and some volcanism. Oligocene emergence, block faulting, and volcanism followed. Serpentine occurs along the Bartlett Trough trend and may be mantle material remobilized several times during the history. It was exposed at the surface for the first time during the Late Cretaceous deformation.—*from* Authors' abstract

06923 **Deunff, Jean; Evitt, William R.** *Tunisphaeridium*, a new acritarch genus from the Silurian and Devonian: Stanford Univ. Pubs. Geol. Sci., v. 12, no. 1, 18 p., illus., 1968.

This paper describes three new species of morphologically distinctive acritarchs which are referred to a new genus, *Tunisphaeridium*. *T. concentricum* (type species), *T. caudatum*, and *T. parvum* are known from a large number of specimens from the Llandoverian [Maplewood Shale, Middle Silurian] of western New York State. Their abundance and fine preservation permit a detailed and quantitative analysis of their morphology. *T. concentricum* and *T. caudatum* also occur in the Gedinian [Devonian] of Tunisia and the genus is represented in the Ludlow of England and the Ludlow–Gedinian of Spain.—Authors' abstract

DeWald, O. E. *See* Bassinger, B. G. 00923

Dickey, D. D. *See* McKeown, F. A. 00729

06814 **Dickey, D. D.** Fault displacement as a result of underground nuclear explosions, *in* Nevada Test Site: Geol. Soc. America Mem. 110, p. 219–232, illus., 1968.

At the Atomic Energy Commission's Nevada Test Site, displacement has occurred along several faults as a consequence of underground nuclear explosions. Three

possible explanations for fault displacements caused by underground explosions are proposed: (1) The explosion-produced stress added to the existing stress field is sufficient to exceed the force of static friction along the fault plane; (2) The vibrations produced by the explosion may reduce friction along the fault, thereby reducing the amount of stress required to cause displacement, and the existing stress field causes the displacement; or (3) The combination of mechanisms 1 and 2 causes displacement. Comparison of seismic energy release from several explosions, some of which triggered displacement along the Yucca fault, indicate that the seismic energy released by fault displacement was greater than that of the triggering explosion in two instances.—Author's abstract

06838 **Dickson, G. O.** Improved efficiency in time domain I.P. practice [abs.]: Mining Eng., v. 20, no. 12, p. 58, 1968.

Diehl, C. H. H. *See* Roddy, D. J. 00724

07011 **Dieterich, James H.** Multiple folding in western Connecticut—A reinterpretation of structure in the New Haven–Naugatuck–Westport area, Trip D–2 *in* Guidebook for field trips in Connecticut—New England Intercollegiate Geol. Conf., 60th Ann.Mtg., New Haven, 1968: Connecticut Geol. and Nat. History Survey Guidebook 2, 13 p., paged separately, 1968.

The Paleozoic metamorphic rocks are primarily metasediments with lesser amounts of metaigneous (volcanic?) rock. The rocks have a strongly linear northeast-trending structural pattern. Metamorphism varies from chlorite-grade in the east to sillimanite-grade in the west. Numerous deformational episodes are suggested from the mapping, which show a rather complex structural configuration. Folded folds and a few twice-folded folds are evident; the major structures are three superimposed major fold systems. A road log of nine stops is given.—HRC

00919 **Dill, Robert F.** Pleistocene sea-level fluctuations off southern California and their relation to continental slope sedimentation [abs.]: Am. Assoc. Petroleum Geologists Bull., v. 53, no. 2, p. 457–458, 1969.

07016 **Dineley, D. L.** Cornubia and the palaeogeography of a continental margin: Ussher Soc. Proc., v. 2, pt. 1, p. 3–13, illus., 1968.

A sequence of paleogeographic and tectonic events, similar to mid- and late Paleozoic in South West England and Europe is indicated in the Appalachian region of the Gulf of St. Lawrence. Both areas show geological structures truncated by the present coastlines and striking directly across the adjacent continental shelf. Stratigraphic, tectonic and other data support the hypothesis of initial Paleozoic unity, and eventual separation by continental drift. Interest in mechanisms for this movement by convection currents has been rekindled by work in the mid-Atlantic ridge. Movements below the continental masses may explain other Paleozoic events in the Appalachian and Variscan provinces. A pattern of sub-sialic movement related to opening of the Atlantic Ocean basin might explain such crustal movement in the Cornubian section of Paleozoic Europe.—*from* Author's abstract

06904 **Dionne, Jean-Claude.** Fossiles marins Pléistocènes dans la partie nord du Lac Saint-Jean [with English abs.], *in* Éditions spéciales du centenaire, 1868–1968—Sciences de la terre: Naturaliste Canadien, v. 95, no. 6, p. 1401–1408, illus., tables, 1968.

Laflamme Gulf marine shells in postglacial deposits are reported probably for the first time in the northern part of the Lac-Saint-Jean Area. *Macoma balthica, Hiatella arctica, Balanus* sp. and (?) *Nuculana* sp. were observed in five localities north of Val Jalbert and as far as Dolbeau; seven non-marine species were also observed at Pointe-Bleue. The minimum value for the level of the postglacial submergence in this area is 180 m. *Balanus* sp. is here reported for the first time in this area; so are probably the non-marine species collected at Pointe-Bleue.

Dionne, Jean-Claude. *See* Laverdière, Camille. 07002

00901 **Dix, C. H.** Searching for stratigraphic traps [abs.]: Am. Assoc. Petroleum Geologists Bull., v. 53, no. 2, p. 470–471, 1969.

Dodd, J. Robert. *See* Stanton, Robert J. 00786

Doe, Bruce R. *See* Peterman, Zell E. 00821

00714 **Doell, Richard R.** Secular variation in the Central Pacific during the last 10,000 years [abs.]: EOS (Am. Geophys. Union Trans.), v. 50, no. 4, p. 129, 1969.

00895 **Doerner, David.** Paleogene sequence in northern Channel Islands, California [abs.]: Am. Assoc. Petroleum Geologists Bull., v. 53, no. 2, p. 469, 1969.

07087 **Donato, R. J.; Hobson, George D.** Transit sonar measurements in Lake Ontario off the mouth of the Niagara River, *in* Conf. on Great Lakes research, 11th, Milwaukee, Wis., 1968, Proc.: Ann Arbor, Mich., Internat. Assoc. Great Lakes Research, p. 179–187, illus., 1968.

Amplitude of signal from Kelvin Hughes Transit Sonar records have been compared with bottom samples to identify bottom materials. There is virtually no penetration into the bottom sediments by the sound beam from the sonar. Recorded intensity of the reflected beam is dependent upon both bottom topography and the sediment materials at the water–sediment interface. One profile, surveyed along 5 miles of the Niagara River above Niagara-on-the-Lake, shows the strong reflection from the east bank of the river as well as a strong indication of a sand and mud bottom. Records of 20 other profiles surveyed off the mouth of the Niagara River are shown, with interpretation of bottom materials and correlation with data from coring stations and hydrographic charts.—*from* Authors' abstract

06989 **Doonan, C. J.; Hendrickson, G. E.** Ground water in Gogebic County, Michigan: Michigan Geol. Survey Water Inv. 8, 22 p., illus., tables, geol. map, 1968.

Ground-water resources of Gogebic County may be inadequate in some parts of the county to meet the needs of expanding population and industry. Well yields of several hundred gallons per minute can be developed in some areas. In other areas, however, the relatively small amount needed for a household is difficult or impossible to obtain. Water from most wells and springs is moderately hard, and some yield water containing objectionable amounts of iron. Public water supplies are obtained from wells and springs [chiefly in beds of sand and gravel in the glacial drift, mostly along streams], and abandoned mines. [Well records and drillers' logs are tabulated in appendix.]—*from* Authors' abstract

00935 **Dosch, Murray W.** Hopper Canyon oil field: California Div. Oil and Gas, California Oil Fields—Summ. Operations 1968, v. 54, no. 1, p. 23–30, illus., tables, 1969.

Hopper Canyon oil field is on the Sespe–Piru anticlinal trend which is part of the overthrust plate of the San Cayetano fault. Strata of the Miocene Modelo Formation, composed of a series of fossiliferous sandstones and shales, were deposited in temperate marine waters at medium depth; indications are that they are over 5,000 feet thick at one location. In the Main area, there are three rather poorly definable producing zones. Oil production is declining at the rate of three percent per year.—MCM

Douglas, M. C. *See* Matich, M. A. J. 06962

00950 **Drake, Avery Ala, Jr.; Epstein, Jack B.; Aaron, John M.** Geologic map and sections of parts of the Portland and Belvidere quadrangles, New Jersey–Pennsylvania: U.S. Geol. Survey Misc. Geol. Inv. Map I-552, scale 1:24,000, 1969.

Duane, David B. *See* Berg, Dennis W. 07009

07044 **Duncan, J. M.** Undrained strength and pore-water pressures in anisotropic clays, *in* Australia–New Zealand Conf. on Soil Mechanics and Found. Eng., 5th,

Aukland, 1967, Proc.: Petone, New Zealand, Sigma Print Ltd., p. 68–71, illus.; discussion, p. 90–91 [1968?].

Studies have shown that many clays are anisotropic with respect to undrained strength and with respect to development of pore-water pressures in sufficient degree to affect significantly the results of stability analyses. Consideration of anisotropic clay properties may be included in either total stress or effective stress stability analyses by means of reasonably simple techniques. The undrained strength variation determined by trimming undisturbed compression test specimens in various directions may be used directly in total stress analyses, and the pore-water pressure characteristics may be derived quite easily from the strength characteristics and the initial stress conditions of the clay.—Author's abstract

00723 **Duncan, John R.; Morgan, W. Jason; Melson, William G.; Simkin, Thomas; Banks, Harold; Gottfried, David.** Juan de Fuca Ridge bathymetry—Independent evidence of sea-floor spreading [abs.]: EOS (Am. Geophys. Union Trans.), v. 50, no. 4, p. 185, 1969.

00971 **Eargle, D. Hoye.** Factors in the formation of uranium deposits, Coastal Plain of Texas [abs.]: Houston Geol. Soc. Bull., v. 11, no. 7, p. 19, 1969.

Eberlein, G. Donald. *See* Ovenshine, A. Thomas. 00634

00916 **Echols, Ronald J.; Barnes, Sarah S.; Harman, Robert A.** Sediment-foraminiferal relations within inner sublittoral zone off coast of Washington [abs.]: Am. Assoc. Petroleum Geologists Bull., v. 53, no. 2, p. 463, 1969.

06820 **Eckel, Edwin B.** (editor). Nevada Test Site: Geol. Soc. America Mem. 110, 290 p., illus., tables, 1968.

This collection of papers summarizes the geologic and hydrologic findings by a team of earth scientists in detailed investigations since 1956 for the Atomic Energy Commission in the region of the Nevada Test Site. Twenty-seven papers are cited individually; these are essentially as presented orally at the 18th Annual Meeting of the Rocky Mountain Section of the Geological Society of America in Las Vegas, in 1966.—GDC

06821 **Eckel, Edwin B.** Development of geologic knowledge at Nevada Test Site, *in* Nevada Test Site: Geol. Soc. America Mem. 110, p. 5–10, illus., 1968.

Additions to geologic and hydrologic knowledge from the AEC nuclear test program since 1956 have been great. Initially the character of the Nevada site was known only by reconnaissance. Ten years later geologic maps cover 2,000 sq mi at 1:24,000, and the adjacent 3,000 sq mi at 1:125,000 or larger scales, and complex volcanic and sedimentary stratigraphy, structure, and geologic history of this part of the Basin and Range Province have been worked out in detail; deep intermontane fills and their ground water are known in three dimensions. All this stems from a well-supported integrated team of geologists, geophysicists, hydrologists and laboratory experts, working closely with engineers and nuclear physicists.—GDC

00914 **Edmondson, William F.** Geologic effects produced by compaction of Meganos gorge fill, California [abs.]: Am. Assoc. Petroleum Geologists Bull., v. 53, no. 2, p. 462, 1969.

07076 **Edmunds, William E.; Koppe, Edwin F.** Coal in Pennsylvania: Pennsylvania Geol. Survey Educ. Ser. 7, 28 p., illus., tables, 1968.

Earliest coal noted in Pennsylvania, 1752, was located near present Saltsburg; earliest record of mining, 1761, was near Fort Pitt (now downtown Pittsburgh). With development of great industries and railroads, coal mining grew to a peak of 278 million tons in 1917; it is now over 90 million tons each year. Briefly reviewed are the composition and origin of coal, history of Pennsylvania's coal-bearing rocks, and the fossilized plants and animals. Most striking is the increasing rank of coal from west to east; thickness and other variations are local. Estimated reserves in million tons, originally 75,093 for bituminous and 22, 805 for anthracite, are now

58,022 and 11,264 respectively. Appended is a list of local names in some cases still applied to the coal beds, most of which are regionally correlated.—GDC

06812 **Ege, John R.** Stability index for underground structures in granitic rocks, *in* Nevada Test Site: Geol. Soc. America Mem. 110, p. 185–197, illus., table, 1968.

More than 2,400 feet of core drilled for an underground installation in the Climax stock, at the north end of Yucca Flat, was logged to relate degree of weathering, relative hardness, core loss and broken core to joint frequency. By statistical regression analysis correlation was significant until joints exceeded 8 per ft and lost and broken core became greater than 30 percent. Parameter values were assigned to 10 grades of joint frequency, which were related to laboratory-determined physical and mechanical properties of core samples previously determined by logging. Rock grades correlated significantly with dry bulk density, total porosity, and Young's shear, and bulk moduli, but not Poisson's ratio. Underground mapping confirmed that rock grades 8 to 10 presented no construction or stability problems, 5 to 7 tended to have moderate overbreak, 3 and 4 were unstable, and ϕ (faults) to 2 incompetent.—GDC

Ehrlich, Garry G. *See* Schoen, R. 06897

06871 **Eimon, Paul I.; Morris, David B.** A computer-oriented data storage and retrieval system in mineral exploration [abs.]: Mining Eng., v. 20, no. 8, p. 22, 1968.

06976 **Einaudi, Marco T.** Sphalerite-pyrrhotite-pyrite equilibria—A re-evaluation: Econ. Geology, v. 63, no. 7, p. 832–834, illus., 1968.

Calculation of the hexagonal pyrrhotite-pyrite-sphalerite equilibrium curve from published data indicates that the mole percent of FeS in sphalerite increased from 15 at 742°C to 26 at 308°C. This curve is in disagreement, below 500°C, with those already published.—Author's abstract

06795 **Ekren, E. B.; Rogers, C. L.; Anderson, R. Ernest; Orkild, P. P.** Age of basin and range normal faults in Nevada Test Site and Nellis Air Force Range, Nevada, *in* Nevada Test Site: Geol. Soc. America Mem. 110, p. 247–250, illus., 1968.

The two normal fault systems consist of an earlier system of two sets striking northeast and northwest, and a later single set striking north. In Kawich and Belted Ranges, the Belted Range Tuff, 13 to 14 m.y. old and faulted by north-trending faults, laps onto older volcanics broken by both systems. The older faults formed after extrusion of the oldest welded tuff at 26.5 m.y. North-trending faults appeared after deposition of Fraction Breccia at 17.8 m.y.; the present ranges were well defined prior to extrusion of Thirsty Canyon Tuff at 7 m.y. In southern Bombing and Gunnery Range, north-trending faults, of the same age as those to the north, change strike from north to northeast. This rotation, caused by drag during later right-lateral movement, suggests that displacement along Las Vegas Valley shear zone has occurred within the last 17 m.y.—*from* Authors' abstract

Ekren, E. B. *See* Anderson, R. Ernest, 06807

Ekren, E. B. *See* Noble, Donald C. 06808

06822 **Ekren, E. B.** Geologic setting of Nevada Test Site and Nellis Air Force Range, *in* Nevada Test Site: Geol. Soc. America Mem. 110, p. 11–19, illus., table, 1968.

These areas lie north and east of the Las Vegas Valley–Walker Lane shear zone, near the thickest part of the Paleozoic Cordilleran miogeosyncline, and east of large Mesozoic plutons. Ranges other than volcanic-tectonic mountains trend north except where rotated to northeasterly strike near Las Vegas Valley. Alluvial basins comprise 30 percent of the area; a total 40,000-ft thickness of Paleozoic and uppermost Precambrian strata form 30 percent of the outcrops; the remainder is primarily Tertiary volcanic rock and intrusives. Two Mesozoic thrust-fault systems displaced several tens of miles in the eastern and southern parts. Normal faults are widely abundant, some have throws of several thousand feet. Transcurrent faults appear to be satellitic to the Las Vegas Valley shear zone.—*from* Author's abstract

00693 **Ellingson, Jack A.** Geology of the Goat Rocks volcano, southern Cascade Mountains, Washington [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 15, 1969.

00694 **Ellingson, Jack A.** Paleozoic sedimentary and metamorphic rocks in the southern Cascade Mountains, Washington [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 15–16, 1969.

Ely, R. W. *See* Pierce, R. W. 00816

Emerson, D. O. *See* Hulbe, C. W. H. 00664

Epstein, Jack B. *See* Drake, Avery Ala, Jr. 00950

07012 **Ergun, Sabri.** X-ray studies of coals and carbonaceous materials: U.S. Bur. Mines Bull. 648, 35 p., illus., tables, 1968.

X-ray diffraction patterns of coals below anthracite rank cannot be structurally interpreted. Those of hydrogenated and dehydrogenated coals indicate, with increase in bituminous rank, a conversion of alicyclic structure into aromatic layers, size 10 A in low-rank anthracites. Coalescence of layers increases rank; high-rank anthracites have layer sizes 25 to 40 A and 3-dimensional reflections of graphite; layers in meta-anthracite are >1000 A, its basic structure that of defective crystalline graphite. Differences in structure of components in low-rank coals disappear with higher rank. Patterns of sedimented organic matter, except impsonites, differ from those of coals; their hydrogen contents are high. Patterns of uranium-bearing coals show increased diffuseness with decrease in hydrogen content, accompanied by increase in uranium and possibly more tetrahedral structures.—*from* Author's abstract

Erickson, Barrett H. *See* Grim, Paul J. 00924

Erskian, Malcolm G. *See* Lipps, Jere H. 00630

Erskian, Malcolm G. *See* Lipps, Jere H. 00662

06797 **Essington, Edward H.; Sharp, John V. A.** Some aspects of ground-water solution chemistry, underground nuclear explosion zones, Nevada Test Site, *in* Nevada Test Site: Geol. Soc. America Mem. 110, p. 263–273, illus., tables, 1968.

Silicate melts from deep underground nuclear explosions in silicate media scavenge most of the radionuclides to form radioactive glass at the base of collapse rubble chimneys. The glass may react with ground water, transferring to it the radioactivity. This possible means of radio-contaminating water supply at the Nevada Test Site is indicated in leaching experiments. Glass from the Rainier test in Tertiary tuff, broken and graded into size fractions, was equilibrated for two days and 56 days with water simulating the local ground water. A small but constant amount of alpha and beta radioactivities of the glass was dissolved for particle fractions above 500 microns; below this, dissolved radioactivities increased progressively with decrease in particle size. The first equilibration released more radioactivity than did the second. Further study is needed.—GDC

00850 **Esteva, Luis.** Probabilistic models for seismic force design—Discussion [of paper 5950, by J. R. Benjamin, 1968]: Am. Soc. Civil Engineers Proc., v. 95, paper 6373, Jour. Structural Div., no. ST 2, p. 309–311, 1969.

A basic implication of the Bayesian treatment overlooked in the paper [ibid., v. 94, no. ST 5, p. 1175–1196] is that it allows for consideration of nonzero previous information, which may come from a variety of sources. The manner of incorporating all significant information is discussed. The basic decision model in the paper employs modified Mercalli intensity as a measure of damage potential; better predictions of behavior may be made if available information on both seismicity and structural response is used.—ESL

00738 **Evernden, J. F.; Kistler, R. W.** Potassium–argon and rubidium–strontium geochronology of Mesozoic plutonic rocks in California [abs.]: EOS (Am. Geophys. Union Trans.), v. 50, no. 4, p. 330, 1969.

Evernden, J. F. *See* Kistler, R. W. 00739

Evitt, William R. *See* Scholl, David W. 00906

Evitt, William R. *See* Deunff, Jean. 06923

07022 **Fairbridge, Rhodes W.** (editor). The encyclopedia of geomorphology—Encyclopedia of earth sciences series, V. 3: New York, Reinhold Book Corp., 1,295 p., illus., tables, 1968.

This volume, third in a series of which eight volumes have been published or are in preparation, constitutes the first alphabetic treatment of the science of geomorphology—the study of the landscape and of the geologic forces that produce it. The 410 articles on subdisciplines, processes, and types of features, each with bibliographic references, are contributed by 150 authors, including many specialists, representing 20 countries. Type geographic examples illustrate each article; in addition, each of the world's more important lakes or inland seas is treated under its own heading. Thorough treatment is given to stratigraphy and climate of the Quaternary Period and Holocene Epoch, and to quantitative geomorphology. There are numerous cross-references within the volume and to related disciplines in other volumes, and an extensive index.—VMJ

Fantozzi, J. H. *See* Szasz, S. E. 00920

Farrell, D. F. *See* Pollock, S. J. 00757

Farrell, E. F. *See* Wilkins, R. W. T. 00972

00925 **Farrell, W. E.; May, B. T.** Paleomagnetism of Permian redbeds from the Colorado Plateau: Jour. Geophys. Research, v. 74, no. 6, p. 1495–1504, illus., tables, 1969.

Partial thermal demagnetization of Permian sediments from two locations on the Colorado Plateau has, in some cases, isolated a thermally stable paleomagnetic direction that is significantly different from the results previously published for the Permian rocks of the southwestern United States. The stable magnetization was successfully recovered from samples of the Halgaito tongue of the Cutler formation, the Hoskinnini tongue of the Moenkopi (Triassic?) formation, the Toroweap formation, and the Hermit shale. The NRM of other formations, including the Supai, was found to be thermally unstable. Thermal demagnetization shows that a secondary component of magnetization parallel to the Earth's present dipole field direction has probably been acquired by all the Permian sediments of this area.—Authors' abstract

Faure, Gunter. *See* Goldberg, Edward D. 00760

Fenske, Paul R. *See* Holly, Donald E. 06811

06825 **Fernald, Arthur T.; Corchary, George S.; Williams, William P.; Colton, Roger B.** Surficial deposits of Yucca Flat area, Nevada Test Site, *in* Nevada Test Site: Geol. Soc. America Mem. 110, p. 49–55, illus., 1968.

Yucca Flat is underlain by coalescing colluvial–alluvial fans, developed where minor streams emerge from the mountains, and alluvial fans formed by major streams. The first, rubble mixed with gravel, reflects adjacent bedrock and in places merges upslope into talus. The second, largely coarse gravel on the piedmont, becomes finer-grained in the lowland, grading into playa deposits of Yucca Lake. Most fans are of Recent age; some terraces and dissected fans are probably late Pleistocene. Older Quaternary and Tertiary deposits, thick fanglomerates in some places, thin pediment deposits in others, collectively contain boulder- to pebble-sized gravel, rubble and sand. The fanglomerates were now deeply dissected, but

their distribution indicates that broad aprons once bordered the mountains.—*from* Authors' abstract

00718 **Feth, J. H.** (and others). Mineralized ground-water resources of the conterminous United States [abs.]: EOS (Am. Geophys. Union Trans.), v. 50, no. 4, p. 150, 1969.

00905 **Field, A. J.; Peterson, Melvin N. A.** *Glomar Challenger* and deep-sea drilling program [abs.]: Am. Assoc. Petroleum Geologists Bull., v. 53, no. 2, p. 459, 1969.

07039 **Field, William O.** The effect of previous earthquakes on glaciers, *in* The great Alaska earthquake of 1964—Hydrology, Pt. A: Natl. Acad. Sci. Pub. 1603, p. 252–265, illus., table, 1968.

A review of literature primarily from Alaska is given. The rapid recession of glaciers as well as surges in the period 1900–1913 were attributed to the earthquakes of 1899, but in recent decades this cause-and-effect relationship has been challenged. Subsequent earthquakes, especially that of 1958, caused some calving, but no significant long-term results have been noted.—Author's abstract

00681 **Fields, Robert W.; Rasmussen, Donald L.** Biostratigraphy and correlation of the Cabbage Patch beds, Granite and Powell Counties, Montana [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 16, 1969.

06801 **Fierstine, Harry L.** Swollen dorsal fin elements in living and fossil *Caranx* (Teleostei:Carangidae): Los Angeles County Mus. Contr. Sci., no. 137, 10 p., illus., 1968.

Hyperostoses, hypertrophied basal bones of the first dorsal spine of a perciform fish, *Caranx* sp., were found in marine middle Miocene deposits of Sharktooth Hill, Kern County, Calif., first record of the genus from the California Miocene. The species differs morphologically from the Austrian Miocene *C. carangopsis*, and histologically from the living *C. hippos*. Of 32 specimens of *C. hippos* from the Gulf of California and eastern Pacific Ocean, only those longer than 343 mm contained hyperostoses; none were found in specimens of four other living species. The bone, egg-shaped with deep posterior notch and cancellous center, may aid in erection of the dorsal fin. Most living species of *Caranx* are restricted to nearshore tropical or subtropical waters; a similar environment is suggested for the Sharktooth Hill fauna.—VMJ

00689 **Fife, Donald. L.** Landslides in the Black Mountain quadrangle, Los Angeles County, California [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 16–17, 1969.

Finch, Warren I. *See* Olive, Wilds W. 00753

07077 **Fischer, Irene; Slutsky, Mary; Shirley, F. R.; Wyatt, P. Y., 3d.** New pieces in the picture puzzle of an astrogeodetic geoid map of the world: Bull. Géod., no. 88, p. 199–221, illus., tables, 1968.

The astrogeodetic map presented in 1960 has been updated to reflect the accumulation of new data. The geoid map of North America has been recomputed, that of South America enlarged, and a geoid chart of Australia has been added. Terrestrial gravity was used for interpolation and satellite observation for intercontinental connection. World datum parameters were derived in various solutions. Satellite positioning of the major astrogeodetic datum blocks lead to an equatorial radius a = 6 378 142 m for a flattening f = 1/298.25. If surface gravity is included, the radius is larger. A reference figure with a = 6 378 150 m and f = 1/298.3 is recommended for practical applications.—DBV

00713 **Fiske, Richard S.** Anatomy of an active volcano—Kilauea 1965–68 [abs.]: EOS (Am. Geophys. Union Trans.), v. 50, no. 4, p. 113, 1969.

Fiske, Richard S. *See* Melson, William G. 00746

09950 **Fiskell, J. G. A.; Rowland, L. O.** Deep profile studies of soil genesis and weathering in Okeechobee County: Soil and Crop Sci. Soc. Florida Proc. 1967, v. 27, p. 142–150, table, 1968.

Seventeen profiles were sampled to the underlying Caloosahatchee shell layer and included 9 soil series located on 4 ice-age terraces near Lake Okeechobee. Indices of soil genesis were the fine sand content of sand separates, heavy mineral content of the total sand fraction, soil Sr and free Fe oxides. Most of the soils were alkaline. Some contained deposits of free lime from ground water or artesian water in the upper horizons. Soluble salt level in these soils was relatively high at depths many meters above the piezometric surface. Acetate-extractable Ca was very much higher than Mg or K. Under conditions of high pH and Ca, clays were low in crystalline minerals with quartz, halloysite or kaolinite, and montmorillonite present in relatively low amounts. It was concluded that several marine depositions occurred and that the clay in these was probably highly weathered before the alkaline conditions developed.—Authors' abstract

06804 **Fitch, John Edgar.** Otoliths and other fish remains from the Timms Point silt (early Pleistocene) at San Pedro, California: Los Angeles County Mus. Contr. Sci., no. 146, 29 p., illus., 1968.

Over 1,000 pounds of fossiliferous Timms Point silt yielded 2,601 otoliths, 121 vertebrae, 68 teeth, 2 dermal denticles, and 1 fin spine. These remains had come from a minimum of 62 species (53 bony fishes and 9 elasmobranchs) belonging to 54 genera in 30 families. Nine of the 53 teleost species belong to two families of deep-sea fishes (Myctophidae and Melamphaidae) that seldom have been captured in water shallower than 1,000 feet, and six other species are "northern" forms that have not been noted within several hundred miles of the Timms Point locality during modern times.—Author's abstract

06992 **Folger, D. W.** New particulate matter sampling devices and effects of technique on marine suspensate recovery: Deep-Sea Research, v. 15, no. 6, p. 657–664, illus., 1968.

Two devices—an underway water spot sampler and a continuous flow sampler—for collection of suspended particulate matter at sea are described, and comparisons are made with other commonly used techniques such as plastic buckets or hull-mounted intake devices. Any device which collects samples close to the ship is susceptible to ship-derived contamination and thus the new underway samplers or ones of similar type in which contamination is controlled by towing clear of the ship's wake or by filtering in situ, are prerequisites for acquisition of usable data on terrigenous detritus in areas far from shore.—VSN

Fowler, Gerald A. *See* Boettcher, Richard S. 00888

00891 **Fowler, Gerald A.; Muehlberg, Gary E.** Tertiary Foraminiferal paleoecology and biostratigraphy of part of Oregon continental margin [abs.]: Am. Assoc. Petroleum Geologists Bull., v. 53, no. 2, p. 467, 1969.

07020 **FragaPurata, Jorge A.** Los métodos sismológicos en la exploración petrolera: Geología y Metalurgía, v. 3, no. 24, p. 5–53, illus., tables, 1968.

Seismic exploration methods are reviewed, as applied to petroleum exploration and in particular to the operations of Petróleos Mexicanos in Mexico. Successive chapters treat: basic concepts of reflection and refraction methods; types of elastic waves; their relations in the seismologic process, and modern recording techniques; principal methods of determining seismic velocities in rock formations; advantages and limitations of seismic exploration methods in petroleum exploration.—VMJ

00851 **Franklin, Arley Graves.** Energy dissipation and nonlinear mechanical response in a kaolin clay [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 29, no. 7, p. 2421B, 1969.

06994 **Fredlund, Daniel A.; Cope, Joseph R.** Utilization of Bald Mountain mine tailings, Trojan, South Dakota. South Dakota Acad. Sci. Proc. 1968, v. 47, p. 85–96, illus., tables, 1968.

To evaluate additional values in the mine waste, 31 composite drill-hole samples were analyzed. Results indicated potentially economic values of gold and silver. The upper tailings pond was found to average 0.0275 oz gold per ton by atomic absorption and 0.0289 oz by fire assay. Silver content was found to average 0.494 by fire assay. The lower pond averaged 0.0153 oz gold per ton by atomic absorption and 0.0183 by fire assay. The silver content was found to average 0.576 oz per ton by fire assay. Associated elements were identified but were found to be uneconomical. Extractive methods are discussed.—*from* Authors' abstract

00761 **Freeze, R. Allan.** The mechanism of natural ground-water recharge and discharge—[Pt.] 1, One-dimensional, vertical, unsteady, unsaturated flow above a recharging or discharging ground-water flow system: Water Resources Research, v. 5, no. 1, p. 153–171, illus., tables, 1969.

Infiltration and evaporation are in physical and mathematical continuity with recharge and discharge. Water table fluctuations result when the rate of ground-water recharge or discharge is not matched by the unsaturated flow rate created by infiltration or evaporation. A water-table rise is the source of replenishment to the ground-water zone that allows the rate of recharge to continue. This behavior can be simulated by a one-dimensional, numerical mathematical model involving transient flow through an integrated saturated-unsaturated system. Solutions are applicable to homogeneous, isotropic soils in which the functional relations show hysteresis properties. The model allows upper boundary conditions of constant rate rainfall, ponded water, evaporation, and redistribution; it can be used to determine water-table fluctuation from a given set of initial conditions, boundary conditions, and soil type.—*from* Author's abstract

Friedel, R. A. *See* Retcofsky, H. L. 07047

00973 **Frye, Charles I.** Stratigraphy of the Hell Creek Formation in North Dakota: North Dakota Geol. Survey Bull. 54, 65 p., illus., geol. map, 1969.

The Hell Creek was divisible into eight members, seven new. The Pretty Butte and Huff Members are recognizable over all of western and central North Dakota and eastern Montana. The others are recognized only in their areas of outcrop. The top of the Hell Creek is considered a time line based on studies of fossils and bentonites; no unconformity was found. The base became progressively younger to the east, and was vertically and horizontally gradational with the Fox Hills in the east and lies unconformably on it in the west The Hell Creek members represent subaerial top-set beds of a giant delta stretching into the Cretaceous Fox Hill sea. Laterally equivalent marine top-set beds are the Fox Hills Formation. Fore-set and bottom-set beds are the Pierre Shale. [Nine type sections of the Hell Creek and its members comprise Appendix A].—*from* Author's abstract

Fuqua, B. D. *See* Brown, D. A. 07042

Furbish, William J. *See* Clarke, James W. 00826

06946 **Furlong, Robert B.** Clay minerals in the Gypsum Spring and lower Sundance Formations, eastern Big Horn Mountains: Earth Sci. Bull., v. 1, no. 3, p. 5–16, illus., table, 1968.

The clay minerals of these formations were analyzed for their significance in interpreting the geologic history and paleoenvironment of the area during Middle and Late Jurassic time. Illite constituted over 50 percent of the clay component; montmorillonite and mixed-layer clay generally 30 percent or less; chlorite, 20 percent; kaolinite, trace amounts. Depositional conditions were lagoonal or marginal, where circulation was periodically so restricted that gypsum was formed. Near absence of kaolinite, the evaporites present, and the high carbonate to clastic ratio in nearly all lithic units suggest an arid or semi-arid climate. The prevalence of calcium and magnesium carbonate in the formations, suggests that this illite-

montmorillonite–chlorite suite is principally residual in origin, transported to the site rather than authigenically formed.—GDC

00822 **Gagnon, Paul M.** Geology indicates Senex has big reserves potential: Oilweek, v. 20, no. 1, p. 13, 122, illus., 1969.

Discovery of oil in the GPD Noel et al Senex 7–27 is important because it may indicate major reserves. The Keg River formation was deposited by a transgressing Middle Devonian sea, and in northeastern Alberta, a large carbonate shelf developed. The Senex discovery is on the up–dip edge of the shelf where porosity and thickness decrease. The find could be 30 mi long and 4–5 mi wide and a recovery of 80–90 bbls per acre foot is possible.—ESL

Galloway, James. *See* Goldberg, Edward D. 00760

Ganus, W. J. *See* Harshbarger, J. W. 06840

00861 **Gardner, Douglas Hanson.** Structure and stratigraphy of the northern part of the Snake Mountains, Elko County, Nevada [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 29, no. 7, p. 2493B, 1969.

Garman, R. K. *See* Goodell, H. G. 00781

Garside, Larry J. *See* Johnson, Gary D. 06982

Garske, David H. *See* Kernaghan, James S. 06891

07024 **Gazin, C. Lewis.** A new primate from the Torrejon middle Paleocene of the San Juan basin, New Mexico: Biol. Soc. Washington Proc., v. 81, art. 58, p. 629–634, illus., 1968.

Torrejonia wilsoni, described and illustrated, occurs as jaw and teeth fragments in the upper fossiliferous zone of the Torrejon beds in the Nacimiento Formation from the east branch of the Arroyo Torrejon in the San Juan basin of New Mexico.—HRC

00690 **Gilbert, C. M.; Lajoie, K. R.; Christensen, M. N.** Low–density sedimentary fill in Mono basin, California [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 18, 1969.

Gilbert, C. M. *See* Reed, Walter E. 00783

00934 **Gilchrist, J.; Thorpe, A. N.; Senftle, F. E.** Infrared analysis of water in tektites and other glasses: Jour. Geophys. Research, v. 74, no. 6, p. 1475–1483, illus., tables, 1969.

The water contents of some tektites, impactites, and artificial glass of tektite composition have been determined by infrared analysis. With one exception, the 25 tektites measured had an average water content of 0.012 ± 0.004 wt percent. Water analyses of a series of glasses made in a solar furnace at atmospheric pressure, synthetic tektite glasses, and impactites showed an average water content of 0.043 ± 0.013 wt percent and hence suggest that they were formed in an atmosphere having a higher water content than that in which tektites were formed. A comparison of the water content of selected small areas in tektite thin sections shows a nonuniform distribution and somewhat lower water content along what appears to be the aerodynamically heated side of the tektite. The results generally suggest that tektites were formed in a partial–to–high vacuum.—Authors' abstract

Gill, Harold E. *See* Minard, James P. 00752

Glass, C. E. *See* Carver, G. A. 00698

07068 **Gluskoter, Harold J.** Geology of a portion of western Marin County, California (including parts of Bolinas, San Geronimo, and Inverness 7 1/2 minute quadrangles):

California Div. Mines and Geology Map Sheet 11, scale about 1 in. to 4,000 feet, section, text, 1968.

In the map-area, the San Andreas fault zone separates Monterey and Merced strata on the west from the Franciscan Formation to the east. Cenozoic formations are the Miocene Monterey and Pliocene Merced Formations, and Quaternary alluvium and deposits. The Jurassic-Cretaceous Franciscan Formation which crops out east of the fault zone consists of metamorphic rocks, silica-carbonate rocks, serpentine, igneous rocks (mainly spilites), limestone, chert, and undifferentiated rocks; dominant rock type is dark, dense, poorly sorted wackes and arenites. The NW-SE trend of the four zones in the Franciscan is the major structural feature in the map-area. Known mineral resources include limestone, petroleum, copper, and various stone products.—MCM

00682 **Godchaux, M. M; Kays, M. A.** Petrology of the Greyback intrusive complex and contact aureole, southwestern Oregon [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 18–19, 1969.

00760 **Goldberg, Edward D.; Somayajulu, B. L. K.; Galloway, James; Kaplan, I. R.; Faure, Gunter.** Differences between barites of marine and continental origins: Geochim. et Cosmochim. Acta, v. 33, no. 2, p. 287–289, tables, 1969.

U, Th and Sr concentrations and Sr and S isotopic ratios have been determined on a group of barites. The isotopic analyses and the U and Th concentrations appear to be especially diagnostic in distinguishing between marine and continental origins of the mineral. These critiques have been applied to some barites recovered off the California coast.—Authors' abstract

Goldberg, Edward D. *See* Griffin, John J. 00767

Goldberg, Paul S. *See* Bjork, Philip R. 06901

Golden, H. G. *See* Shamburger, V. M., Jr. 07070

Golden, H. G. *See* Reed, P. C. 07071

Golden, H. G. *See* Newton, J. G. 07073

Golden, H. G. *See* McWilliams, R. G. 07074

00683 **Goles, G. G.; Randle, K.** Trace element geochemistry as an aid to tephrachronology [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 19, 1969.

00781 **Goodell, H. G.; Garman, R. K.** Carbonate geochemistry of Superior deep test well, Andros Island, Bahamas: Am. Assoc. Petroleum Geologists Bull., v. 53, no. 3, p. 513–536, illus., table, 1969.

The 14,585-ft deep Superior Oil Company well at Stafford Creek, Andros Island, Bahamas, penetrated four sequences of dolomite, each of which is capped with limestone or partly dolomitized limestone. The original lithology throughout the well was predominantly aragonite-pellet mud similar to that now accumulating west of Andros Island. The four sequences record four major depositional cycles, each of which was terminated by a period of erosion and dolomitization. The proposed model for dolomitization requires solution-cannibalization of mixed carbonate phases at sea level in order to furnish magnesium for dolomitization. The four periods of uplift are correlated with Cuban orogenic episodes of the inter-Late Cretaceous, middle Eocene, end of Eocene, and lower Miocene.—SEF

Goodell, H. G. *See* Martin, J. R. 00832

00684 **Goodspeed, G. E.** Rapakivi granite from the Salmon River Mountains, Idaho [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 19–20, 1969.

06810 **Gordon, Mackenzie, Jr.; Poole, Forrest G.** Mississippian–Pennsylvanian boundary in southwestern Nevada and southeastern California, *in* Nevada Test Site: Geol. Soc. America Mem. 110, p. 157–168, illus., 1968.

At several localities this stratigraphic boundary coincides with the contact between the Eleana Formation and overlying Tippipah Limestone, or equivalent strata. Characteristic ammonoids and brachiopods are illustrated; late Morrowan forms of Tippipah ammonoids indicate hiatus. Near Red Canyon in Nye County, Nev., thin Eleana limestone of late Chester age is separated by 100 feet of shale and mino quartzite from Morrowan platy Tippipah limestone, marked by 3 inches of conglomeratic limestone; northwest of Friedman Flat the separation is by 14 feet of shale. In Clark County a similar sequence, Indian Springs Member of the Bird Spring Formation, with Chester brachiopods 25 feet below the top, is referred to equivalents of Chainman Shale and Tippipah Limestone; one foot of conglomeratic limestone marks the Pennsylvanian base. The same lithologic sequence is recognized on Nopah Range, Inyo County, Calif.—GDC

Gottfried, David. *See* Duncan, John R. 00723

Gottfried, David. *See* Tilling, Robert I. 00731

Grantz, Arthur. *See* Clark, M. M. 00701

07000 **Green, Morton; Parris, David C.** *Dinohyus* in the Sharps Formation [abs.]: South Dakota Acad. Sci. Proc. 1968, v. 47, p. 350, 1968.

00902 **Greene, H. Gary.** Portable refraction seismograph survey of gold placer areas near Nome, Alaska [abs.]: Am. Assoc. Petroleum Geologists Bull., v. 53, no. 2, p. 471, 1969.

Greene, H. Gary. *See* Scholl, David W. 00906

00685 **Gresens, Randall L.** The possible roll of oxidation-reduction reactions and reaction kinetics in the petrogenesis of blueschists [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 20, 1969.

Gresens, Randall L. *See* Stensrud, Howard L. 00788

00831 **Grey, D. C.; Damon, P. E.; Haynes, C. V.; Long, Austin.** Carbon-isotope fractionation during wet oxidation of oxalic acid: Radiocarbon, v. 11, no. 1, p. 1–2, 1969.

The usual procedure for preparation of CO_2 from the oxalic-acid standard—wet oxidation by means of potassium permanganate in acid solution—suffers from difficulty in determining end point of the reaction. The method of preparation at the University of Arizona laboratory was reviewed to learn the factors responsible for fractionation. It was clear that fractionation progresses steadily throughout the wet oxidation of oxalic acid and that color change and cessation of bubbling are not adequate criteria for determining the end point. Freeze-thaw operations are layer processes occurring at cold-trap walls and may preserve serial fractionation through several cold-trap operations. It is necessary to monitor continually the δC-13 values of the standard gas. Dry combustion affords an effective alternative to wet oxidation, but it also has problems.—MCM

06890 **Gries, John Paul; Niven, David W.; Crooks, Thomas J.** Recharge of the Pahasapa Limestone aquifer from stream losses, Black Hills, South Dakota: South Dakota Acad. Sci. Proc. 1968, v. 47, p. 56–61, illus., 1968.

Water losses along the principal streams on the east side of the Black Hills were investigated where they cross the outcrop of the Pahasapa Limestone. Water table in the limestone is normally below stream level. Part of the water loss from the streams enters the artesian system and moves away; the rest raises the water table locally. Alluvium in the valleys varies from fine silt to coarse gravel, and the latter may carry many second feet. As the streams were entrenched, they intersected a network of caverns. Very little cavern filling occurred except for rocks. Caverns

appearing on sharp bends in the creeks are probably the main source of water loss, but the importance of those in the stream beds has been underestimated. There is free interchange of water between the surface streams, the subflow in the alluvium, and the caverns.—ESL

00767 **Griffin, John J.; Goldberg, Edward D.** Recent sediments of Caribbean Sea, *in* Tectonic relations of northern Central America and the western Caribbean: Am. Assoc. Petroleum Geologists Mem. 11, p. 258–268, illus., tables, 1969.

The mineral compositions of sediments of the Caribbean Sea have been ascertained on the basis of X-ray diffraction analyses. As a result of the studies of the clay-size fraction (smaller than 2 μ) and the silt-size fraction (2–37 μ), it is possible to divide the Caribbean basin into at least two general petrographic provinces, a western province bordering the Central American coast and a southern province extending out from the coast of South America. There is probably another province adjacent to the Greater and Lesser Antilles, but the data from the regions were insufficient to outline the province clearly.—Authors' abstract

00924 **Grim, Paul J.; Erickson, Barrett H.** Fracture zones and magnetic anomalies south of the Aleutian trench: Jour. Geophys. Research, v. 74, no. 6, p. 1488–1494, illus., 1969.

Magnetic anomalies south of the Aleutian trench between 164° and 180° W. trend east-west. The magnetic pattern is disrupted at 173° W. and 177°30′ W. by north-south-trending fracture zones named Amlia and Adak fracture zones, respectively. Correlation of magnetic anomaly profiles shows apparent left-lateral offsets of 220 km across the Amlia fracture zone and 30 km across the Adak fracture zone. The amplitudes of the anomalies are sharply reduced where they intersect the trench, resulting in a magnetically "quiet zone" over most of the Aleutian trench and terrace. Although there are suggestions that the fracture zones extend north of the trench, the evidence is inconclusive.—Authors' abstract

00733 **Gruntfest, Irving J.; Shaw, Herbert R.** Earth tides as a significant source of heat [abs.]: EOS (Am. Geophys. Union Trans.), v. 50, no. 4, p. 318, 1969.

06918 **Guernsey, Lee.** Selected effects of glacial till on the physical characteristics and existing land use of Indiana's strip mined lands: Indiana Acad. Sci. Proc. 1967, v. 77, p. 305–311, illus., tables, 1968.

The paper is a case study of the texture and acidity of glacial till spoil banks as compared to nonglaciated spoil banks. It also measures land use changes in reclaiming glaciated and nonglaciated strip mine areas. Finally, an appeal is made for reclamation plans to better correlate physical capabilities and existing land use of the strip mined lands in Indiana.—Author's abstract

06839 **Guilbert, J. M.; Lowell, J. D.** Lateral and vertical alteration mineralization zoning in porphyry copper deposits [abs.]: Mining Eng., v. 20, no. 12, p. 67, 1968; Econ. Geology, v. 64, no. 1, p. 118–119, 1969.

Hail, W. J., Jr. *See* Pipiringos, G. N. 00774

Haley, Boyd R. *See* Merewether, E. A. 00976

Hall, W. E. *See* Heyl, A. V. 06872

Hamilton, Robert M. *See* Healy, John H. 00728

00686 **Hamilton, Thomas D.** Geologic archeology in the Alaskan interior [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 21, 1969.

00687 **Hamilton, Thomas D.** Glacial history of the central Brooks Range, Alaska [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 21–22, 1969.

Hansen, Richard O. *See* Shlemon, Roy J. 00784

06997 **Hanson, C. Bruce.** Individual variation and evolutionary change in dentition of *Hyracodon* [abs.]: South Dakota Acad. Sci. Proc. 1968, v. 47, p. 352, 1968.

Haraldson, Harald C. *See* Anderson, Sidney B. 07051

Harding, James L. *See* Logan, Brian W. 00763

Hardt, W. F. *See* Cooley, M. E. 00959

06895 **Harksen, J. C.** *Ondatra* from the Pleistocene of South Dakota: South Dakota Acad. Sci. Proc. 1968, v. 47, p. 46–48, illus., 1968.

This genus has not been reported previously from the Pleistocene of South Dakota. Five specimens have been collected within the past two years from three sites in Bennett, Walworth, and Lincoln Counties. The present geographic range of the muskrat in North America is indicated on a map.—ESL

00889 **Harman, Robert A.; Cooper, Susan C.** Distribution of Foraminifera on Alaskan and Siberian continental shelves [abs.]: Am. Assoc. Petroleum Geologists Bull., v. 53, no. 2, p. 466, 1969.

00915 **Harman, Robert A.** Processes affecting distribution of Foraminifera and other biogenic sediment components off coast of Washington and Oregon [abs.]: Am. Assoc. Petroleum Geologists Bull., v. 53, no. 2, p. 462–463, 1969.

Harman, Robert A. *See* Echols, Ronald J. 00916

Harris, J. R. *See* Hughes, Judson B., Jr. 00921

Harshbarger, J. W. *See* Cooley, M. E. 00959

06840 **Harshbarger, J. W.; Ganus, W. J.** Water supply and water control management [abs.]: Mining Eng., v. 20, no. 12, p. 58, 1968.

00669 **Hart, Earl W.** Possible active movement along the Nacimiento fault zone, southern Coast Ranges, California [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 22–23, 1969.

Hassall, Geraldine I. *See* Callow, W. J. 00835

00670 **Hawkins, James W., Jr.** Late Cenozoic vulcanism in southern California and its possible bearing on the rift origin of the Gulf of California [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 23–24, table, 1969.

00671 **Hawkins, James W., Jr.; Whetten, John T.** Hydrothermal investigations of the origin of graywacke-matrix minerals in natural sediments [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 24, 1969.

Hay, Ruth J. *See* Ogden, J. Gordon, 3d. 00836

Haynes, C. V. *See* Grey, D. C. 00831

06809 **Healey, D. L.** Application of gravity data to geologic problems at Nevada Test Site, *in* Nevada Test Site: Geol. Soc. America Mem. 110, p. 147–156, illus., table, 1968.

Gravity surveys for underground nuclear testing sites in Nevada have been important in determining thickness of Cenozoic rocks. Large negative anomalies are produced by density contrast between sedimentary and volcanic units and more dense older rocks. In Yucca Flat, thickness estimates checked against drill-hole data indicate an average density contrast of 0.7 gm/cc; estimates checked in drill holes have an average error of 18 percent. Reconnaissance of Pahute Mesa north of the Nevada Test Site defined the largest gravity low in the area. By applying the density contrast

of 0.7 gm/cc to the 63 mgal anomaly, a minimum 7,000-ft thickness of volcanic rocks under Pahute Mesa was estimated. Exploratory deep drilling, extended to include the mesa, produced cores from a 13,686-ft hole still in volcanic rock; indicated density contrast of only 0.33-0.36 gm/cc suggests thickness of 16,000 feet.—GDC

00728 **Healy, John H.; Hamilton, Robert M.** Seismic activity following the "Benham" nuclear explosion [abs.]: EOS (Am. Geophys. Union Trans.), v. 50, no. 4, p. 248, 1969.

Heins, R. W. *See* DeGeoffroy, J. 06944

06841 **Heitman, George.** The impact of government policies on petroleum development [abs.]: Mining Eng., v. 20, no. 12, p. 48, 1968.

Henderson, D. M. *See* Moore, D. M. 00776

Hendrickson, G. E. *See* Doonan, C. J. 06989

06965 **Henoch, Władysław.** Badania glacjologiczne w Kanadzie (Glaciological research in Canada) [with English and Russian abs.]: Przegląd Geog., v. 40, no. 2, p. 299-305, illus., 1968.

This article lists briefly government agencies and private organizations conducting glaciological research, and areas of their investigation in Canada. Research projects undertaken as Canada's contribution to the International Hydrological Decade are described. The Canadian Government, recognizing the necessity to centralize research in hydrology and glaciology, instituted the Inland Water Branch, Department of Energy, Mines and Resources, and Glaciology Section within its framework. The Research program of the Glaciology Section is outlined. Technological progress of recent years has developed many new tools of research. Some of these and some of the latest methods of research being introduced in glaciology are described.—*from* Author's abstract

07088 **Herdendorf, Charles E.** Sedimentation studies in the south shore reef area of western Lake Erie, *in* Conf. on Great Lakes research, 11th, Milwaukee, Wis., 1968, Proc.: Ann Arbor, Mich., Internat. Assoc. Great Lakes Research, p. 188-205, illus., tables, 1968.

During the first year of a three-year program to relate the effect of physical environment to the ecology of sport and commercial fish species, physical characteristics of major bedrock reefs and surrounding areas were studied by mapping reef topography, sampling and analyzing the bedrock and surface and subsurface sediments, and measuring present sedimentation. Extensive sampling of surface sediments and bedrock, and of subsurface sediments by borings, revealed an original stream-cut terrain underlain by Silurian bedrock which was first scoured by Pleistocene glaciation, then buried beneath glacial till followed by glacial-lake sediments. Plant-detritus deposits overlain by silt and clay west of Bass Islands indicate a low lake stage immediately following retreat of the last glacier, before rebound raised the western drainage outlet to its modern level.—VMJ

06842 **Herfindahl, Orris F.** The value of mineral surveys to economic development [abs.]: Mining Eng., v. 20, no. 12, p. 48, 1968.

Heron, S. Duncan. *See* Clarke, James W. 00826

06872 **Heyl, A. V.; Hall, W. E.** Distribution of minor elements in ore and host rock, Illinois-Kentucky fluorite district and upper Mississippi Valley zinc-lead district [abs.]: Mining Eng., v. 20, no. 8, p. 25, 1968.

07079 **Hilborn, James D.; Canadian Petroleum.** (editors). Dusters and gushers—The Canadian oil and gas industry: Toronto, Ontario, Pitt Publishing Co. Ltd., 278 p., illus., tables, 1968.

This volume is devoted to a generalized description of the many facets of the Canadian oil and gas industry. There are 26 chapters in all, each by an authority on a different phase of the petroleum and related industries; those pertinent to geology are cited separately.—HRC

00962 **Hill, F. L.** Five Points oil field: California Div. Oil and Gas, California Oil Fields—Summ. Operations 1968, v. 54, no. 1, p. 61–65, illus., tables, 1969.

Strata of the Five Points field range from Upper Cretaceous Panoche Formation to Holocene deposits; their thickness and lithology are shown in a table. The field is near the axis of the San Joaqiun structural basin; contours on top of the Eocene Domengine sand indicate a faulted homoclinal structure. Subsurface studies reveal that pre–Domengine diastrophism resulted in folding of the sand unit and underlying sediments; the latter were subsequently truncated and overlain by the transgressive deposition of Domengine grit, thus forming a truncated pinch-out reservoir. Cumulative production through July 1968 is 67,710 bbl oil.—MCM

Himmelberg, G. R. *See* Loney, R. A. 00643

06794 **Hinrichs, E. Neal.** Geologic structure of Yucca Flat area, Nevada, *in* Nevada Test Site: Geol. Soc. America Mem. 110, p. 239–246, illus., 1968.

Chief rocks east of the Tippinip high-angle reverse fault are upper Precambrian to middle Paleozoic, folded into the Halfpint anticline, cut by steep major faults that trend northwest; west are middle and upper Paleozoic rocks in five northeast-trending folds, with numerous normal and reverse faults. Projections of the Tippinip fault and CP Mine Mountain thrusts beneath Yucca Flat are inferred. The folds and faults control Mesozoic granitic intrusives in the northern Precambrian and lower Paleozoic rocks. Climax and Twinridge stocks crop out on the crest of Halfpint anticline, the former truncated by Tippinip fault; Gold Meadows stock intrudes Cambrian and Precambrian rocks of a poorly exposed thrust plate in the west. Many younger normal faults, probably related to subsidence in the Yucca Flat basin, cut Tertiary volcanics and Quaternary alluvium.—GDC

00673 **Hirschfield, Sue Ellen.** Distribution of nearctic Pliocene megalonychid ground sloths [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 25, 1969.

00719 **Hiss, William L.** Acquisition and machine processing of saline-water data [abs.]: EOS (Am. Geophys. Union Trans.), v. 50, no. 4, p. 151, 1969.

00672 **Hoare, J. M.** Geology and petrology of the volcanic rocks of Nunivak Island, Alaska [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 25, 1969.

Hobson, George D. *See* Donato, R. J. 07087

06873 **Hodder, R. W.; Schiller, E. A.** Character of a small deposit amenable to open pit mining, southeast coastal Maine [abs.]: Mining Eng., v. 20, no. 8, p. 27, 1968.

Hoffman, Dale S. *See* Petkewich, Richard M. 00782

06843 **Holland, C, T.** Longwall roof control problems and the use of rock mechanics in their solution [abs.]: Mining Eng., v. 20, no. 12, p. 46, 1968.

06811 **Holly, Donald E.; Fenske, Paul R.** Transport of dissolved chemical contaminants in ground-water systems, *in* Nevada Test Site: Geol. Soc. America Mem. 110, p. 171–183, illus., 1968.

The manner in which contaminants enter a ground-water system determines one of the boundary conditions used to solve the differential transport equation; the physical and chemical characteristics of the system appear as parameters in its solution. One-dimensional solutions, obtained for cases of radioactive contamination from underground nuclear explosion and from reactor waste disposal, can be applied to nonradioactive contamination by assuming an infinite half-life

of the contaminant. The solutions assume complex forms consisting of exponential and complimentary error function terms. Some of these terms might be neglected without materially affecting the accuracy of solution of a practical transport problem. Before this can be done, methods must be developed for evaluation of parameters describing the environmental physical and chemical conditions.—*from* Authors' abstract

00675 **Holmgren, Dennis A.** Columbia River Basalt stratigraphic patterns near Yakima and Columbia Gorge areas, Washington and Oregon [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 26, 1969.

Holt, R. J. *See* Murphy, V. J. 06880

Hon, Rudolph. *See* Wones, David R. 00736

00750 **Honda, S.; Muffler, L. J. Patrick.** Hydrothermal alteration in Yellowstone drill hole Y-1, Upper Geyser Basin [abs.]: EOS (Am. Geophys. Union Trans.), v. 50, no. 4, p. 348, 1969.

Hood, P. J. *See* Belyea, H. R. 07082

06798 **Hoover, D. L.** Genesis of zeolites, Nevada Test Site, *in* Nevada Test Site; Geol. Soc. America Mem. 110, p. 275–284, illus., 1968.

Zeolites, cristobalite, quartz, feldspar, and clay minerals were deposited by ground water that leached vitric volcanics as it moved down through the unsaturated zone, increasing in cation content and pH. As movement reduced and saturation increased, reactions occurred just above the following barriers: relatively impermeable welded tuffs, lava flows, and Paleozoic clastic rocks; clay minerals formed by leaching of vitric rocks just above relatively permeable Paleozoic carbonate rocks; and zeolitized rocks just above either of these barriers. Relations between zeolitized rocks, regional water level, stratigraphy, and hydrothermally altered volcanic rocks and pre-Tertiary sedimentary rocks beneath zeolitized rocks is shown in a section from Pahute Mesa to Yucca Flat and south. Ca and Mg are concentrated uppermost in the zeolitized rocks, K in the middle, and Na lowermost.—GDC

Hoover, D. L. *See* Orkild, Paul P. 06815

06844 **Hopkins, D. M.; Nelson, C. H.; Tagg, A. R.; Wang, F.** Exploration for minerals and fuels in the northern Bering Sea [abs.]: Mining Eng., v. 20, no. 12, p. 63, 1968.

00628 **Hopkins, Kenneth D.** Late Quaternary glaciation and volcanism on the south slope of Mount Adams, Washington [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 27, 1969.

00900 **Hornsby, James M.** Seismic record section in depth [abs.]: Am. Assoc. Petroleum Geologists Bull., v. 53, no. 2, p. 470, 1969.

06845 **Horsnail, R. F.** The influence of waterlogged overburden on the secondary dispersion of copper and molybdenum in some areas of British Columbia [abs.]: Mining Eng., v. 20, no. 12, p. 47, 1968.

00855 **Hosking, Peter Leighton.** The relationship between lithology and surface form in a fluvially dissected landscape—An examination of the morphologic character of the upper portion of the St. Francis River basin, Mo., . . . to determine . . . lithologic influences on landscape evolution [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 29, no. 7, p. 2485B–2486B, 1969.

00970 **Hoskins, E. R.** The failure of thick-walled hollow cylinders of isotropic rock: Internat. Jour. Rock Mechanics and Mining Sci., v. 6, no. 1, p. 99–125, illus., tables, 1969.

A series of experiments was performed on thick-walled hollow cylinders of five different types of isotropic rock. The magnitude of the intermediate principal stress appears to have a marked and regular effect on the strength of these rocks. None of the commonly used failure criteria for brittle materials adequately describe the results of these experiments. A recent proposal to generate a failure surface for a given material by rotating triaxial test data about the principal stress axis seems to be supported by these test results, at least at low confining pressures. There appears to be a smooth transition between extension and compression failure under combined polyaxial stress conditions. The possible effects of stress gradients on rock strength and the types of fracture observed in these tests are discussed.—*from* Author's abstract

07064 **Hospers, J.; VanAndel, S. I.** Palaeomagnetic data from Europe and North America and their bearing on the origin of the North Atlantic Ocean: Tectonophysics, v. 6, no. 6, p.475–490, illus., tables, 1968.

The polar wandering curves of Europe and North America are discussed in the light of the latest available paleomagnetic data. Criteria are described by which data are selected for calculation of new paleomagnetic mean pole positions. These data are used to construct new polar wandering curves for Europe and North America. Results confirm Runcorn's (1956) interpretation in that two significantly different polar wandering curves are found which favor the concept of continental drift. Paleomagnetic results are compared with those of Bullard et al (1956) by fitting of Atlantic continental slope topography. The paleomagnetic data confirm the fit. Paleomagnetic data are insufficient to determine the exact moment when opening of the North Atlantic Ocean began.—*from* Authors' summary

00825 **Hosterman, J. W.** Clay deposits of Spokane County, Washington: U.S. Geol. Survey Bull. 1270, 96 p., illus., tables, geol. map, 1969.

The clay deposits of eastern Washington occur along the eastern and northeastern margin of the Columbia Plateau where basalt flows lap onto older rocks. Five genetic types of clay are recognized: white residual clay (saprolite), derived from pre-Tertiary igneous and metamorphic rocks; bluish-gray residual clay (saprolite), derived from Columbia River Basalt (Tertiary); residual and transported clays in the Latah Formation (Miocene); brown silty clay of the Palouse Formation (Pleistocene); and light-greenish-gray silty clay of the glacial lake deposits. Pre-Tertiary saprolite and the Latah Formation clays would be useful for refractory products, fillers, and as an aluminum ore. Basalt saprolite would be useful for an aluminum ore with a titanium byproduct. The Palouse Formation and glacial lake deposits are useful in making common brick.—JWH

Hotz, Preston E. *See* Lanphere, Marvin A. 00658

00663 **Hotz, Preston E.** Relations between the Dothan and Rogue Formations, southwest Oregon [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 27–28, 1969.

06823 **Houser, F. N.** Application of geology to underground nuclear testing, Nevada Test Site, *in* Nevada Test Site: Geol. Soc. America Mem. 110, p. 21–33, illus., table, 1968.

Underground nuclear testing has the advantage of elimination of radioactive fallout, and of improved economy, instrumentation, public safety, and scientific experimentation. Geologic studies permit detailed appraisal of the test site's suitability—large tracts having peculiar geologic properties are required; paramount hazards are ground-water contamination and ground-shock damage to population centers. Individual tests pose problems in ground-water distribution, detailed rock distribution and structure, and in predicting behavior of test medium: how it will expand, fracture and contract, how the cavity will fill with debris and water, how the medium will confine fission products. Simplified examples are presented. Background data can be extended to peaceful applications.—GDC

06803 **Howard, Hildegarde.** Tertiary birds from Laguna Hills, Orange County, California: Los Angeles County Mus. Contr. Sci., no. 142, 21 p., illus., 1968.

Approximately 120 of more than 200 avian bone fragments collected from one locality in Leisure World, Laguna Hills, Calif., can be given family assignment. At least 19 species are represented, but only nine are specifically assigned, even on a tentative basis. One genus and four species are newly described. The avifauna does not relate to that of any one of the other Tertiary localities in southern California, but individual species show greater resemblance to those of Middle and Late Miocene than to those of the Pliocene.—Author's abstract

00745 **Howard, Keith A.** Lava channels in northeastern California [abs.]: EOS (Am. Geophys. Union Trans.), v. 50, no. 4, p. 341, 1969.

00980 **Hsü, K. Jinghwa.** Comments on the paper by J. D. Byerlee, "Frictional characteristics of granite under high confining pressure" [1967]: Jour. Geophys. Research, v. 74, no. 6, p. 1712–1713, illus., 1969.

Byerlee's conclusion (ibid., v. 72, no. 14, p. 3639–3648, 1967) that the Mohr–Coulomb criterion of rock fracture does not hold for the deformation of Westerly granite under high confining pressure is erroneous. The Mohr envelope for the Westerly granite is nearly a straight line for normal stresses less than 10 kb—in other words, the Coulomb criterion for brittle fracture is actually proved by Byerlee's experiments. Byerlee makes an important contribution in showing that the Mohr–Coulomb equation can be used to predict the shear stress required to induce sliding along pre-existing fractures. The shear strength term should not be assumed to be zero in considering mechanics of overthrusting; because the computations of Hubbert and Rubey (1959) were based on that wrong assumption, their results are largely erroneous.—DBV

Huggins, L. F. *See* Skaggs, R. W. 06899

00921 **Hughes, Judson B., Jr.; Harris, J. R.; Patterson, S. O.** Advances in interpretation of offshore seismic data [abs.]: Am. Assoc. Petroleum Geologists Bull., v. 53, no. 2, p. 458, 1969.

06874 **Hughes, T. H.** Minor elements in galena and sphalerite, Cave-In-Rock district, Illinois [abs.]: Mining Eng., v. 20, no. 8, p. 25, 1968.

00664 **Hulbe, C. W. H.; Emerson, D. O.** Volcanic sequence of the Warner Mountains, northern California [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 28, 1969.

07081 **Hunt, A. D.; Woodward, H. W.** Oil potential of Canada's Arctic islands, *in* Dusters and gushers—The Canadian oil and gas industry (J. H. Hilborn and Canadian Petroleum, editors): Toronto, Ontario, Pitt Publishing Co. Ltd., p. 61–72, illus., 1968.

The Sverdrup basin is described. Over 40,000 feet of sediments of Paleozoic and Mesozoic age have been recognized, as have numerous potential oil-bearing structures. Some are Pennsylvanian evaporite deposits forming domes. To date, no production is known, but considering the size of the basin, and the known volume of sediments, between 30 and 100 billion bbls of oil and considerable natural gas are potentially present.—HRC

06922 **Hutchison, J. Howard.** Fossil Talpidae (Insectivora, Mammalia) from the later Tertiary of Oregon: Oregon Univ. Mus. Nat. History Bull. 11, 117 p., illus., tables, 1968.

The Talpidae of the late Tertiary of Oregon are described and their relationships discussed. Two new genera, *Scapanoscapter* and *Achlyoscapter*, a new subgenus, *Xeroscapheus* and six new species, *Mystipterus pacificus*, *?Neurotrichus columbianus*, *Scalopoides ripafodiator*, *Scapanoscapter simplicidens*, *Scapanus (Xeroscapheus) proceridens*, and *Achlyoscapter longirostris*, are recognized.—Author's abstract

06875 **Ikola, R. J.** A regional gravity survey of the Duluth complex and adjacent areas, northeastern Minnesota [abs.]: Mining Eng., v. 20, no. 8, p. 28–28A, 1968.

00963 **Ingram, W. L.** Long Beach oil field: California Div. Oil and Gas, California Oil Fields—Summ. Operations 1968, v. 54, no. 1, p. 5–15, illus., tables, 1969.

Long Beach is one of several major oil fields in the Los Angeles basin associated with the Inglewood–Newport uplift. Formations range from the Jurassic(?) Franciscan to the Pleistocene San Pedro. Producing zones are in the Puente (upper Miocene), and Pico and Repetto (Pliocene) Formations. Peak production was reached in 1923 with more than 68 million bbls from 272 wells; 1967 production was almost 4 million bbls from 898 wells.—MCM

Irwin, William P. *See* Lanphere, Marvin A. 00658

Izett, G. A. *See* Pipiringos, G. N. 00774

00747 **Jackson, Everett D.; Wright, Thomas L.** The magmas and xenoliths of the Honolulu Volcanic Series, Hawaii [abs.]: EOS (Am. Geophys. Union Trans.), v. 50, no. 4, p. 346, 1969.

06920 **Jaeger, Ralph R.; Lipschutz, Michael E.** The shock histories of iron meteorites and their implications [abs.]: Indiana Acad. Sci. Proc. 1967, v. 77, p. 172–173, 1968.

00715 **James, Ivan C.** The relative impact of uncertainty on the water resources planning decision [abs.]: EOS (Am. Geophys. Union Trans.), v. 50, no. 4, p. 145, 1969.

00665 **Janda, Richard J.** Age and correlation of marine terraces near Cape Blanco, Oregon [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 29–30, 1969.

00666 **Jefferson, G. T.** Late Pleistocene mammals from a cave in southern Nevada [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 30, 1969.

Jeletzky, J. A. *See* Muller, J. E. 00631

John, E. C. *See* Smith, W. H. 06885

07034 **Johnson, A. I.** An outline of geophysical logging methods and their uses in hydrologic studies, *in* Selected techniques in water resources investigations, 1966–67: U.S. Geol. Survey Water-Supply Paper 1892, p. 158–164, table, 1968.

Information on the depth, thickness, extent, and structure of an aquifer may be obtained for use of the hydrologist by judicious choice of the proper geophysical logging methods. To assist in making this choice, the various methods of borehole logging, the uses that may be made of each log, and the recommended borehole conditions are summarized. However, proper use of borehole logs requires some knowledge of the geology of the area and considerable experience in log interpretation.—Author's abstract

06982 **Johnson, Gary D.; Garside, Larry J.; Warner, Albert J.** A study of the structure and associated features of Sheep Mountain Anticline, Big Horn County, Wyoming: Earth Sci. Bull., v. 1, no. 2, p. 25–29, illus., reprinted 1968; originally published 1967.

This paper was originally published in Iowa Acad. Sci. Proc. 1965, v. 72, p. 332–342, 1967. *See* Abstracts of North American Geology for May 1967.—MCM

00667 **Johnson, J. D.** Preliminary results of a gravity survey across the San Andreas fault in west central California [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 30, 1969.

06959 **Johnson, Leon J.** X-ray spectrochemical determination of potassium in clay minerals [with French, German, and Russian abs.]: Clays and Clay Minerals, v. 16, no. 5, p. 373–379, illus., tables, 1968.

An X-ray spectrochemical method is compared with photometer determination of potassium in a series of 65 clay fractions. Two methods of preparing samples for X-ray determination were used. In one, a 20 mg sample of clay in suspension was dried onto a plastic disc. K was determined by comparing fluorescence intensity with a sample of known composition. For the second method, a 100 mg sample of dried clay was pressed into a pellet, and sample NBS-98 was used as a standard. Results for both techniques were significantly correlated with flame photometer values. The pellet technique gave a more accurate measure. In either case the X-ray spectrochemical technique provides a fairly rapid and simple procedure that can be useful for handling large numbers of samples.—*from* Author's abstract

00938 **Johnson, William W.** A least-squares method of interpreting magnetic anomalies caused by two-dimensional structures: Geophysics, v. 34, no. 1, p. 65-74, illus., tables, 1969.

As the equations relating magnetic anomalies to shape and susceptibility of a body are nonlinear with respect to coordinates describing the shape, iterative procedures must be used to obtain least-squares estimates of the body coordinates. A method suggested by Marquardt (1963) incorporates the best features of previous methods. In this paper the Marquardt method is applied to interpretation of magnetic anomalies. The two-dimensional formulas derived by Talwani and Heirtzler (1964) are used to relate the geometry of a body to the resulting magnetic anomalies. The procedure efficiently controls the amount of change made to an interpreted structure at each iteration, assuring rapid convergence to a solution which satisfies the observed data better in the least-squares sense than does the initial solution. The method is applied to representative problems.—*from* Author's abstract

00668 **Jones, D. L.** *Buchia* zonation in the Myrtle Group, southwestern Oregon [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 31-32, table, 1969.

Jones, G. H. S. *See* Roddy, D. J. 00724

Jones, John F. *See* Trescott, Peter C. 00722

06894 **Jones, Paul H.** Geochemical hydrodynamics—A possible key to the hydrology of certain aquifer systems in the northern part of the Gulf of Mexico, *in* Internat. Geol. Cong., 23d, Prague, 1968, Proc., Symposium 2, Genesis of mineral and thermal waters: Prague, Academia, p. 113-125, illus., tables, 1968.

The hydrology of artesian aquifer systems in the northern Gulf of Mexico basin can be resolved only by applying the principles of both gravity hydrodynamics and geochemical hydrodynamics. Effective management of the ground-water resources must include not only the conventional methods and procedures for withdrawal, but also innovations such as the following: (1) extraction of fresh water from clay-shale deposits by well fields designed for that particular purpose; (2) development of flowing artesian pressured zones; (3) development of both fresh water and thermal power from self-distillation of superheated brines; and (4) disposal of brine concentrates from any self-distillation systems into aquifer zones selected for osmotic pumping.—KAF

06981 **Joralemon, Ira B.** Environment of generation of some base metal ore deposits [discussion of paper by D. E. White, 1968]: Econ. Geology, v. 63, no. 7, p. 846-847, 1968.

If brines and density stratification play a part in the formation of strata-bound ore deposits, their origin may be very complex. (For original paper see ibid., v. 63, no. 4, p. 301-335, 1968.)—WSW

Josephson, Paul D. *See* Somers, Lee H. 07091

Justus, Philip S. *See* Ragland, Paul C. 07069

Kanai, Kiyoshi. *See* Tanaka, Teiji. 07049

06907 **Kane, Henry E.** Arroyos of the southeastern portion of the Canon City Embayment, Colorado [abs.]: Indiana Acad. Sci. Proc. 1967, v. 77, p. 229, 1968.

Kaplan, I. R. *See* Goldberg, Edward D. 00760

06846 **Katell, Sidney.** Oil shale as a potential source of liquid fuels [abs.]: Mining Eng., v. 20, no. 12, p. 56, 1968.

06936 **Kay, Marshall.** Ordovician formations in northwestern New York [with French abs.], *in* Éditions spéciales du centenaire, 1868–1968—Sciences de la terre: Naturaliste Canadien, v. 95, no. 6, p. 1373–1378, illus., 1968.

The limestones of the Trentonian Series along Black River valley in northwestern New York have been separated into several lithic units, or formations, here defined. The Kings Falls Limestone, a heavy-ledged calcarenite, is late Rocklandian and Kirkfieldian; the Sugar River Limestone, more argillaceous, is Shorehamian; and the Denley Limestone is Denmarkian and lower Cobourgian. Their relationships to Ontario formations are portrayed.—Author's abstract

Kays, M. A. *See* Godchaux, M. M. 00682

Keeling, R. O., Jr. *See* Taylor, G. L. 06960

00948 **Keen, M. J.** Possible edge effect to explain magnetic anomalies off the eastern seaboard of the US: Nature, v. 222, no. 5188, p. 72–74, illus., 1969.

A number of reasonable models of geologic structure can produce the smooth and stacked magnetic anomaly field observed off the eastern United States. Two of three models presented here are varients on an "edge effect" model, in which a thick magnetic continental crust abuts a thin magnetic oceanic crust and a nonmagnetic oceanic mantle; the third explains the anomalies wholly in terms of topography. If the edge effect accounts for the anomalies observed at some continental margins, the oceanic mantle is less magnetic than the continental crust; this would arise if, for example, the oceanic mantle is hotter than the continental crust at the same depth, or if it contains a smaller proportion of magnetic minerals.—DBV

Kehn, Thomas M. *See* Wood, Gordon H., Jr. 00756

07013 **Kehn, Thomas M.** Geologic map of the Graham quadrangle, western Kentucky: U.S. Geol. Survey Geol. Quad. Map GQ-765, scale 1:24,000, section, text, 1968.

Coal has been mined in the northeastern part of the Graham quadrangle since about 1890; recent recovery has been by strip mining. About 60 of the 250 drilled test wells (mostly since 1955) have produced gas or oil from eight pools that are in, or partly in, the map area.—MCM

06876 **Keighin, Charles W.** Geochemical exploration in the southern Illinois fluorspar district—A progress report [abs.]: Mining Eng., v. 20, no. 8, p. 25, 1968.

06877 **Keith, John R.** Relationships of lead and zinc contents of trees and soils, upper Mississippi Valley district [abs.]: Mining Eng., v. 20, no. 8, p. 25, 1968.

07041 **Keller, W. D.** Flint clay and a flint-clay facies [with French, German, and Russian abs.]: Clays and Clay Minerals, v. 16, no. 2, p. 113–128, illus., tables, 1968.

Flint clay is defined as a sedimentary, microcrystalline to crystalline clay (rock) composed dominantly of kaolin, which breaks with a pronounced conchoidal fracture and resists slaking in water. The environment of deposition is commonly low-lying paludal, in basins in clastic silicate rocks or karstic carbonates. It is inferred that parent illitic and/or kaolinitic clay colloids were transported into swamps and underwent further dialysis, alteration, and eventual crystallization *in situ*, producing a homogeneous kaolinite clay possessing interlocking crystalline texture. Flint clay is interpreted as being an intermediate member of a claystone

sequence ranging from high-alumina minerals formed on the highest part, structurally and/or topographically and grading down-structure and/or lower in elevation through flint clay to illite-kaolinite plastic clay and thence to marine illitic shale, all being equivalent stratigraphically.—*from* Author's abstract

00917 **Kelley, James C.; McManus, Dean A.** Heirarchial analysis of variance of shelf-sediment texture [abs.]: Am. Assoc. Petroleum Geologists Bull., v. 53, no. 2, p. 464, 1969.

Kelly, E. J. *See* Lacoss, R. T. 00945

07089 **Kemp, A. L. W.; Lewis, C. F. M.** A preliminary investigation of chlorophyll degradation products in the sediments of Lakes Erie and Ontario, *in* Conf. on Great Lakes research, 11th, Milwaukee, Wis., 1968, Proc.: Ann Arbor, Mich., Internat. Assoc. Great Lakes Research, p. 206–229, illus., tables, 1968.

Surface sediment samples from 32 stations mainly along the axes of Lakes Erie and Ontario were examined for acetone-soluble chlorophyll degradation products; chlorophylls, pheophytins, organic and carbonate carbon, Eh, pH, and particle size distribution were determined. Total chlorophyll concentrations were 0–30 ppm dry weight of sediment; total pheophytins were 0–192 ppm dry weight, with concentrations generally greater for Lake Erie than for Lake Ontario. Phytoplankton chlorophylls were 93–100 percent decomposed before settling on the bottom. Pheophytins decomposed an average of 70 percent, and organic carbon an average of 33 percent, with burial in the sediment to a depth of 5 cm. The lower percentages of organic carbon in Lake Erie sediments (0.23–3.60) than in Lake Ontario (1.90–5.00) are attributed, as with pheophytins, to lower clay content of the Lake Erie sediments.—VMJ

00940 **Kemp, W. C.** Evidence for Pleistocene ice lags: Nature, v. 221, no. 5187, p. 1231–1232, tables, 1969.

The lag between the summer insolation curve at lat 65°N. and the temperature maximum and minimum of core P-6304-9, as measured by the oxygen isotope method, was determined earlier (Kemp and Eger, 1967) by power spectral analysis; in this communication the classical method is used. The auto- and cross-correlation functions are expanded in the orthonormal set of Laguerre functions. The lags shown are about 2,000 years, as expected. This figure appears much more reasonable than the 12,000 years that would be required if the factor controlling Pleistocene glaciation were summer insolation variations at high southern latitudes. It is concluded that the controlling factor was summer insolation variations at high northern latitudes.—DBV

00629 **Kepper, John C.** Hypothesis for the precipitation of sea-floor dolomite during the Cambrian [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 32, 1969.

06891 **Kernaghan, James S.; Garske, David H.; Kiesling, Thomas; Roberts, Bill.** Tungsten mineralization in the southwestern portion of the Harney Peak "dome", Custer County, South Dakota: South Dakota Acad. Sci. Proc. 1968, v. 47, p. 62–67, illus., table, 1968.

The paper deals with the southwestern portion of the ring of xenoliths which define the dome. The gneiss, skarn, marble, amphibolite, and quartzite are described and their stratigraphic relations discussed. Tungsten mineralization is in the form of scheelite, occurring in the marble and skarn usually, but has been found in the amphibolite. In the marble, it occurs as isolated crystals up to 1/2 in. in diameter, and in the skarn in seams. Evidence favors formation of scheelite by metasomatism. The deposits are similar to those in Madera County, Calif.—ESL

Kesling, Robert V. *See* Bjork, Philip R. 06901

06939 **Kesling, Robert V.** *Gennaeocrinus chilmanae*, a new crinoid from the Middle Devonian Silica Formation in southeastern Michigan: Michigan Univ. Mus. Paleontology Contr., v. 22, no. 8, p. 127–131, illus., table, 1968.

A new species of *Gennaeocrinus* from the Middle Devonian Silica Formation is characterized by subconical cup, strongly ornamented BB, RR, and X_1, radial ridges on PBrBr, $IBrBr_1$, $IBrBr_2$, and XX_2, sharp central nodes on higher IBrBr, and unornamented XX plates. The posterior interray is wide and especially prominent. No arms are preserved, but SBr_2 is evidently a secundaxil, indicating at least 20 arms.—Author's abstract

06940 **Kesling, Robert V.** Note on ontogeny of the Middle Devonian crinoid *Proctothylacocrinus esseri* Kesling: Michigan Univ. Mus. Paleontology Contr., v. 22, no. 9, p. 133–138, illus., table, 1968.

Measurements of cup plates in two specimens of *Proctothylacocrinus esseri* [from the Silica Formation, northwestern Ohio] indicate that in general its growth in height and width increased ventrally and posteriorly from the IBB and that its growth in area (at least in the plates measured) centered on RA and the anal series. Basal anal plates probably expanded in order to support the very large, chimney-like anal sac in the adult.—Author's abstract

06941 **Kesling, Robert V.** *Ameliacrinus benderi*, a new dicyclic camerate crinoid from the Middle Devonian Silica Formation in northwestern Ohio: Michigan Univ. Mus. Paleontology Contr., v. 22, no. 11, p. 155–162, illus., 1968.

Ameliacrinus benderi is a new genus and species of the family Archaeocrinidae. Although it occurs in Middle Devonian strata, this crinoid retains several very primitive characters, including a median anal series of plates, rays composed of numerous plates and elevated on the cup, depressed interbrachial areas, acuminate base, and separated radials. It is progressive in having many of its IBrBr plates polygonal and regularly arranged and most of its arm BrBr biserial. IBB of the new crinoid lie in a basal pit, concealed by articulation of the column.—Author's abstract

06942 **Kesling, Robert V.** *Logocrinus conicus*, a simple new Middle Devonian inadunate crinoid from Michigan: Michigan Univ. Mus. Paleontology Contr., v. 22, no. 12, p. 163–167, illus., table, 1968.

Four little crinoids from upper strata of the Middle Devonian Bell Shale in [Alpena County] Michigan are dicyclic inadunates. They are here assigned to the family Scytalocrinidae and made the types of a new species of *Logocrinus*. They are characterized by smooth subconical cup, large IBB, rather short RR, high tapering $PBrBr_1$, and irregular columnals in a round smooth column that expands proximally to blend inconspicuously with the outline of the cup.—Author's abstract

Kiesling, Thomas. *See* Kernaghan, James S. 06891

Kiff, I. T. *See* Worthington, J. E. 06863

00933 **King, Chi-Yu.** Seismic efficiency: Jour. Geophys. Research, v. 74, no. 6, p. 1702–1703, 1969.

Relations among seismic energy, moment, and magnitude suggest that seismic efficiency is probably a slowly increasing function of magnitude if the average operating stress at the ruptured fault segment during an earthquake is independent of magnitude. If the average stress is 300 bars, seismic efficiency is of the order of 1 percent for earthquakes of magnitude 3 to 5.—Author's abstract

Kirby, S. H. *See* Raleigh, C. B. 00734

Kirkby, Anne V. *See* Kirkby, M. J. 00977

00977 **Kirkby, M. J.; Kirkby, Anne V.** Erosion and deposition on a beach raised by the 1964 earthquake, Montague Island, Alaska: U.S. Geol. Survey Prof. Paper 543-H, p. H1–H41, illus., tables, 1969.

Shoreline uplift on Montague Island varied from 15 to 35 feet as a result of the 1964 earthquake. Fifteen months afterwards the uplifted platform had been greatly

modified. Fifty-two percent of the unconsolidated deltaic deposits in MacLeod Harbor had been eroded, and 97 percent of this erosion was fluvial. On narrow cliff-backed beaches, 78 percent of the cliff foot had been obscured by falling debris, corresponding to a subaerial cliff retreat of 0.7 to 2.0 feet per year. An older cliff, 6 to 10 feet high, has been cut back by marine action at the rate of 0.5 feet per year since 2000 B.P. The accuracy of uplifted shoreline features for determining former sea levels was tested using the 1964 raised beach; the most reliable indicator (±2 feet) was the break in slope between a bedrock platform and a cliff.—MJK

Kistler, R. W. *See* Evernden, J. F. 00738

00739 **Kistler, R. W.; Evernden, J. F.** Origin of Mesozoic batholithic rocks in California [abs.]: EOS (Am. Geophys. Union Trans.), v. 50, no. 4, p. 330, 1969.

00655 **Kistler, Ronald W.; Willden, Ronald** Precambrian–Cambrian boundary in the Ruby Mountains, Nevada [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 32, 1969.

06796 **Kistler, Ronald W.** Potassium–argon ages of volcanic rocks in Nye and Esmeralda Counties, Nevada, *in* Nevada Test Site: Geol. Soc. America Mem. 110, p. 251–262, illus., tables, 1968.

K–Ar ages are reported for biotite and sanidine from 29 specimens of Tertiary flows and welded tuffs. In the Indian Trail Formation and older Miocene volcanics, range is 18 to 26 m.y.; in the Piapi Canyon Group the age is 10.5 to 16 m.y.; and in the Thirsty Canyon Tuff the age is 6.2 to 7.5 m.y. Precision estimated, by duplicate analysis, comparison on mineral pairs and different localities in welded tuffs, indicate that to distinguish between two rocks at 95 percent confidence level, their ages must differ by 3.4 to 8.5 percent if each rock is dated by a mineral pair. In contrast to chemical diversity of the rocks, K concentrations in biotite and sanidine from each pyroclastic unit are remarkably consistent. Inconsistence in other units may be due to wrong age determinations, miscorrelation, or contamination.—GDC

07043 **Klausing, Robert L.** Geology and ground water resources of Cass County, North Dakota—Pt. 3, Hydrology: North Dakota Geol. Survey Bull. 47 (North Dakota Water Comm. County Ground Water Studies 8), 77 p., illus., tables, 1968.

Ground water is obtainable from sand and gravel deposits associated with glacial drift and from sand and/or sandstone beds in the Dakota Sandstone. Six major drift aquifers are identified and described: Fargo, West Fargo, Page, Tower City, Bantell, and Sheyenne Delta. The West Fargo is the most permeable and productive and will yield as much as 1,300 gpm to individual wells. Heavy pumping from this aquifer has caused water levels to decline as much as 85 feet since 1938. During 1965, water levels declined more than 2.5 feet at West Fargo, and more than 0.5 feet in areas 20 mi away. Potentially important sources are the Sheyenne Delta aquifer in the south and the Page in the northwest. Water from the glacial drift aquifers generally contains less than 1,500 ppm dissolved solids compared with 2,500 for the Dakota.—*from* Author's abstract

00989 **Knopoff, L.; Shapiro, J. N.** Comments on the interrelations between Grüneisen's parameter and shock and isothermal equations of state: Jour. Geophys. Research, v. 74, no. 6, p. 1439–1450, illus., tables, 1969.

The various methods of computing Grüneisen's parameter are compared. Attempts are made to bring them into closer agreement by taking the elastic moduli and the crystalline anisotropy into account. Effects of melting and fluidity are also considered.—Authors' abstract

Knopoff, L. *See* Shapiro, J. N. 00990

00942 **Knopoff, Leon.** The upper mantle of the Earth: Science, v. 163, no. 3873, p. 1277–1287, illus., 1969.

Since 1961 much progress has been made in the explanation of problems relating to the upper mantle, due in part to the international cooperative project which began

in 1962. This paper reviews important developments in this field. The summary presents the view that large horizontal motions are present at the surface of the Earth and play a vital part in providing constraints on the construction of models of the interior, but much remains to be done in the way of testing the ideas discussed.—DBV

00988 **Knopoff, Leon.** Phase and group slowness in inhomogeneous media: Jour. Geophys. Research, v. 74, no. 6, p. 1701, 1969.

The properties of dispersive waves crossing an inhomogeneous medium are such that the apparent phase slowness is the average of the phase slownesses of the subparts of the medium and the apparent group slowness is the average of the group slownesses.—Author's abstract

00656 **Koenig, James B.** Mercury distribution at two geothermal fields—Coso Hot Springs, California, and Ahuachapan, El Salvador [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 33, 1969.

00717 **Kohout, F. A.** Reorientation of our saline water resources thinking [abs.]: EOS (Am. Geophys. Union Trans.), v. 50, no. 4, p. 150, 1969.

Koppe, Edwin F. *See* Edmunds, William E. 07076

00766 **Kornicker, Louis S.; Bryant, William R.** Sedimentation on continental shelf of Guatemala and Honduras, *in* Tectonic relations of northern Central America and the western Caribbean: Am. Assoc. Petroleum Geologists Mem. 11, p. 244–257, illus., table, 1969.

The sediments are terrigenous detritus, skeletal marine organism debris, and authigenic minerals. Clay is predominant in bay and slope samples; sand in inner-shelf samples; and sand, silt, or clay in outer-shelf samples. Five facies based on sediment size and organisms are recognized. The molluscan–barnacle–clay facies is present on the shelf edge and slope at depths from 50 to 500 fms. The other facies are found on the shelf. Carbonate sediments from 16.5 to 50 fm, and sand and gravel sediments from 12 to 15 fm, are relict deposits of lower sea stands. The relict sand deposits of the shelf are probably being diluted now by recent clays from coastal rivers.—*from* Authors' abstract

06980 **Krook, Leendert.** Origin of bedrock values of placer deposits [discussion of article by E. S. Cheney and Th. C. Patton, 1967, and of discussions by C. B. Gunn, 1968, and R. Tuck, 1968]: Econ. Geology, v. 63, no. 7, p. 845–846, 1968.

In many parts of the world, the occurrence of placer versus barren gravels can be explained best in terms of changes of stream regime, vegetation, and weathering caused by climatic change. (For original paper see ibid., v. 62, p. 852–853, 1967.)—WSW

Kulm, L. D. *See* Bales, William E. 00903

00904 **Kulm, L. D.; Bales, William E.** Shallow structure and sedimentation of upper continental slope off southern and central Oregon—A preliminary investigation [abs.]: Am. Assoc. Petroleum Geologists Bull., v. 53, no. 2, p. 472, 1969.

06998 **Kume, Jack; Ackroyd, Earl A.** Steady-state analog model and analyzer in water resources appraisal projects [abs.]: South Dakota Acad. Sci. Proc. 1968, v. 47, p. 352, 1968.

07032 **Kunkler, J. L.** Field kit for determining alkalinity, *in* Selected techniques in water resources investigations, 1966–67: U.S. Geol. Survey Water-Supply Paper 1892, p. 52–54, illus., 1968.

Accurate field determinations of alkalinity are possible with the described field kit because the temperatures of the standard buffer solutions and the samples are maintained within 2°C of the temperature of the sampling source. Field

determinations of standard solutions indicate that results deviate less than one percent from the correct values.—Author's abstract

00983 **Kuo, John T.** Areal strain of solid earth tides observed in Ogdensburg, New Jersey: Jour. Geophys. Research, v. 74, no. 6, p. 1635–1644, illus., table, 1969.

Improvements of extensometer measurements and a method of comparing observed tidal strain with theory, almost independent of ocean loading, produce an excellent result of strain of solid earth tides at Ogdensburg, N. J. Earth tides are well recorded on an array of three horizontal extensometers installed in a deep mine at Ogdensburg, N. J. A 29-day series for each extensometer from February 16 to March 16, 1966, was analyzed. The latitudinal-, meridional-, and shear-strain components were resolved and analyzed for the M_2 and O_1 constituents. The observed areal strain of solid earth tides at Ogdensburg confirms the theoretical tidal strain based on the Gutenberg-Bullen Earth model with a New York Pennsylvania crustal structure, which has the characteristic number values $h = 0.621$ and $l = 0.084$.—*from* Author's abstract

00732 **Lachenbruch, Arthur H.; Bunker, Carl M.** Vertical distribution of crustal heat sources [abs.]: EOS (Am. Geophys. Union Trans.), v. 50, no. 4, p. 316, 1969.

00945 **Lacoss, R. T.; Kelly, E. J.; Toksöz, M. N.** Estimation of seismic noise structure using arrays: Geophysics, v. 34, no. 1, p. 21–36, illus., table, 1969.

A theoretical study of the use of arrays for the analysis of seismic noise fields has been completed. The frequency-wave number power spectral density is defined and techniques for estimating it are given. Estimates have been made from both long and short-period noise recorded by the Large Aperture Seismic Array in Montana. At frequencies higher than 0.3 Hz, a compressional body-wave component which correlates with atmospheric disturbances over distant oceans has been detected. In the frequency range of 0.2 and 0.3 Hz both body waves and higher mode Rayleigh waves are observed. At frequencies below 0.15 Hz the organized vertical component of microseisms consists primarily of fundamental mode Rayleigh waves. Appreciable amounts of fundamental mode Love wave energy may also be present on horizontal instruments at these low frequencies.—*from* Authors' abstract

07015 **Lai, T. M.; Mortland, M. M.** Cationic diffusion in clay minerals—[Pt.] 2, Orientation effects [with French, German, and Russian abs.]: Clays and Clay Minerals, v. 16, no. 2, p. 129–136, illus., tables, 1968.

Effect of orientation of vermiculite particles on diffusion of Na ion was measured by tracer technique. Mathematical relations of orientation angle, axial ratio of platelets, and diffusion coefficient were developed and applied to vermiculite pellets. Results on Na ion in K-vermiculite of clay size gave diffusion coefficients of 2.21×10^{-7} $cm^2 sec^{-1}$ when diffusion flux was parallel with clay platelets and 0.45×10^{-7} $cm^2 sec^{-1}$ when perpendicular. For diffusion of Na into Na-vermiculite, coefficients were 1.18×10^{-8} $cm^2 sec^{-1}$ when diffusion flux was parallel with clay platelets, and 0.18×10^{-8} $cm^2 sec^{-1}$ when perpendicular. For K-vermiculite, change in apparent diffusion coefficient is a simple one of particle geometry; the Na vermiculite system is more complicated.—*from* Authors' abstract

06928 **Lajoie, Jean.** Turbidites sans matrice produits de diagénèse [with English abs.], *in* Éditions spéciales du centenaire, 1868–1968—Sciences de la terre: Naturaliste Canadien, v. 95, no. 6, p. 1243–1255, illus., tables, 1968.

The high matrix content of Precambrian and Paleozoïc flysch type sandstones has been explained by some by diagenesis. Recent and Cenozoic turbidites are often said to be low in matrix because they are "well sorted." Our object here is to present the analysis of 20 Ordovician sandstone horizons of the flysch facies, with low matrix contents, and to show that diagenesis is responsible for the disappearance rather than the formation of the matrix. The hypothesis that Recent and Cenozoic turbidites have low matrix contents is not supported by the facts.—Author's abstract

Lajoie, K. R. *See* Gilbert, C. M. 00690

Lamport, M. B. *See* Langenheim, R. L., Jr. 00657

00961 **Land, P. E.** East Temblor oil field: California Div. Oil and Gas, California Oil Fields—Summ. Operations 1968, v. 54, no. 1, p. 57–59, illus., tables, 1969.

Strata of East Temblor field range from lower Miocene Phacoides Sandstone to Holocene alluvium. Structure is an easterly plunging syncline with the northern limb cut by a high-angle fault. The single producing zone is in the top of the Phacoides Sandstone which varies from less than 20 feet to about 40 feet in thickness. Production for 1967 was less than 2,000 bbls oil.—MCM

00966 **Land, P. E.** Temblor Ranch oil field: California Div. Oil and Gas, California Oil Fields—Summ. Operations 1968, v. 54, no. 1, p. 51–55, illus., tables, 1969.

Strata of the Temblor Ranch field range from Eocene Point of Rocks Sandstone to Miocene McDonald Shale which is exposed at the surface throughout most of the productive area. The dominant structure is a broad easterly plunging nose cut by two nearly parallel faults—one normal, the other reverse. The only productive zone is the Phacoides Sandstone (lower Miocene) which is encountered at depths ranging from about 250 feet to 900 feet from west to east. The sand is of uniform thickness with the oil-saturated portion varying according to structural position. Because of decline in production, wells in the western section have been shut in since late 1960.—MCM

00657 **Langenheim, R. L., Jr.; Byrd, W. J.; Lamport, M. B.; Winter, J. K.** Geology of the West Range and Ely Springs Range, Lincoln County, Nevada [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 33, 1969.

Langenheim, R. L., Jr. *See* Pierce, R. W. 00816

00658 **Lanphere, Marvin A.; Irwin, William P.; Hotz, Preston E.** Geochronology of crystalline rocks in the Klamath Mountains, California and Oregon [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 34, 1969.

00926 **Larson, E. E.; Strangway, D. W.** Magnetization of the Spanish Peaks dike swarm, Colorado, and Shiprock dike, New Mexico: Jour. Geophys. Research, v. 74, no. 6, p. 1505–1514, illus., tables, 1969.

A detailed study of the magnetic properties of some of the radiating dikes from the Spanish Peaks, Colorado, and from a pair of dikes from Shiprock, New Mexico, indicates that there is no correlation between the direction of stable remanent magnetization and dike orientation. Some dikes have a stable component of remanent magnetization; others do not. In general, magnetic stability is correlated with the presence of small grains observed microscopically. In most samples high-temperature oxidation has been minimal, but most samples have been affected to some degree by low-temperature oxidation. There is no relation between the presence of maghemite and the degree of magnetic stability. The pole position for the Eocene of North America is 81° N., 149° W., close to other lower Tertiary pole positions.—*from* Authors' abstract

LaSalle, Pierre. *See* Sauvé, Pierre. 06931

00862 **Latham, Gary Vincent.** Long-period seismic measurements on the ocean floor—Pt. 1, Bermuda area [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 29, no. 7, p. 2494B, 1969.

Latterell, Helen M. *See* Nayudu, Y. R. 00638

07002 **Laverdière, Camille; Bernard, Claude; Dionne, Jean-Claude.** Les types de broutures glaciaires (glacial chattermarks)—[Pt.] 2, Observations effectuées au Quebec [with English and German abs.]: Rev. Géographie Montreal, v. 22, no. 2, p. 159–173, illus., 1968.

Chattering fractures, conchoidal chattermarks, convex or concave chattermarks (with different types of floors), and chattermarked grooves occur more often than

thought. Most are on bedrock, but they also occur on boulders and cobbles of various origins such as morainic, glaciofluvial, and ice-rafted, which, as far as the authors know, have never been described before from this point of view. Chattermarks can occur on all types of rocks. It has been found that the data are not numerous enough for deducing clear-cut conclusions, however.—*from* Authors' abstract

06932 **Ledoux, Robert.** Étude de la composition minéralogique et de l'altération des minéraux dans un profil de sol de la série des sables St-Jude, comté de St-Hyacinthe [with English abs.], *in* Éditions spéciales du centenaire, 1868–1968—Sciences de la terre: Naturaliste Canadien, v. 95, no. 6, p. 1301–1326, illus., tables, 1968.

Analysis of a sandy soil profile of the St. Jude series shows that fine sand predominates in the A_e, B_f, and B_{fg1} horizons and the amount of mean and coarse sands are considerably increased in the B_{fg2} and C horizons. Twenty-three mineral species are found in the heavy fractions of the fine and very fine sands, whereas only eight are in the light fractions. The most frequent are quartz, orthoclase, plagioclase, hornblende, and garnet. There is a discontinuity in the profile between B_{fg1} and B_{fg2}. Augite is the most vulnerable mineral to weathering. Although the St. Jude soil can be divided into morphologically distinct horizons, the minerals are still in the early stage of weathering.—*from* Author's abstract

Leeds, David J. *See* Tanaka, Teiji. 07049

Lee-Hu, Chin-Nan. *See* Bickford, M. E. 00986

Lewis, C. F. M. *See* Kemp, A. L. W. 07089

Libby, W. F. *See* Berger, Rainer. 00823

00981 **Liebermann, Robert C.; Pomeroy, Paul W.** Relative excitation of surface waves by earthquakes and underground explosions: Jour. Geophys. Research, v. 74, no. 6, p. 1575–1590, illus., tables, 1969.

The surface-wave magnitude (M_s) is used as the measure of the relative excitation of long-period waves by underground explosions and earthquakes in five distinct geographical and tectonic regions of the world. The M_s-versus-m_b data indicate that the underground explosions generated smaller surface waves than earthquakes from the same region of comparable body-wave magnitudes (m_b). The most significant result is that it is possible to separate the earthquake and explosion populations on the basis of their surface-wave magnitudes if the events are analyzed on a regional basis. Theoretical considerations of the dimensions of the seismic source in space and time lead to M_s-versus-m_b relationships that account for the general trend of observational data.—*from* Authors' abstract

00659 **Lillegraven, Jason A.** The stratigraphy and vertebrate fossils of the Oligocene Brule Formation, Slim Buttes, northwestern South Dakota [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 34, 1969.

00854 **Linstedt, Kermit Daniel.** Occurrence of vanadium in the Colorado River and its behavior in water treatment coagulation [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 29, no. 7, p. 2469B, 1969.

00660 **Lintz, Joseph, Jr.** Distribution of concretions at Sabin's anticline, Imperial County, California [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 35, 1969.

00661 **Lintz, Joseph, Jr.: Craib, K. E.** Geological implications of some Arizona lineations [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 35, 1969.

00630 **Lipps, Jere H.; Erskian, Malcolm G.** Distributional patterns of estuarine microfaunas, northern California [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 36, 1969.

00662 **Lipps, Jere H.; Erskian, Malcolm G.** The mechanism and adaptive significance of plastogamy in the foraminiferan *Glabratella ornatissima* (Cushman) [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 35–36, 1969.

Lipschutz, Michael E. *See* Jaeger, Ralph R. 06920

07030 **Lodding, William; Sturm, Edward.** Weathering and orientation in Triassic clay sediments of New Jersey [with French, German, and Russian abs.]: Clays and Clay Minerals, v. 16, no. 2, p. 179–186, illus., tables, 1968.

Composition of clay mineral suites derived from Triassic argillite and shale were compared with those of the consolidated parent sediments. Lockatong argillite, near the weathered zone, is mainly illite, chlorite, and feldspar. In the horizon above, illite replaces the feldspar, and kaolinite increases upward, until near the top of the zone, it is almost the only clay mineral present. The Brunswick shale contains mainly illite. In its weathered zone, kaolinite increases gradually, but about 30 percent illite is found in the top layers. Chlorite in the argillite is randomly oriented while illite shows strong preferred orientation, probably indicating that chlorite formed in place during weathering. The difference in the diagenetic development of these two Triassic beds less than five miles apart, must be attributed mainly to chemical composition and lithology of the parent sediments.—*from* Authors' abstract

00763 **Logan, Brian W.; Harding, James L.; Ahr, Wayne M.; Williams, Joseph D.; Snead, Robert G.** Carbonate sediments and reefs, Yucatán shelf, Mexico—Pt. 1, Late Quaternary carbonate sediments of Yucatán shelf, Mexico: Am. Assoc. Petroleum Geologists Mem. 11, p. 5–128, illus., tables, 1969.

The distribution, stratigraphy, and petrologic characteristics of the shelf sediments are documented, and these data are interpreted in terms of late Quaternary events and environments of deposition. Shelf bathymetry, pre-Wisconsin carbonates, composition and stratigraphy of glacial and postglacial sediments, paleogeography, paleoenvironments, and rates of sedimentation and admixing are all investigated. The juxtaposition of relict and recent deposits results in the interface phenomena of admixing, and the coming to adjustment with the new environment will occur so long as the present depositional regime remains active. If admixing diminishes, the diluted relict sediments will be overlain by present-environment sediments and a bedding plane will result. Such relict sediments could also be present in very shallow water if sea-level has fluctuated.—HRC

00764 **Logan, Brian W.** Carbonate sediments and reefs, Yucatán shelf, Mexico—Pt. 2, Coral reefs and banks, Yucatán shelf, Mexico (Yucatán reef unit): Am. Assoc. Petroleum Geologists Mem. 11, p. 129–198, illus., tables, 1969.

The emergent reefs are an expression of postglacial sedimentation, the essential part being an *in situ* wave-resistant wall which overlies unconformably a limestone foundation. The emergent reef walls can be classified on the basis of shape and subdivided by morphology of growth zones of major biotic communities. Secondary and auxiliary reef deposits occur also as do reef-banks and biostromes. All of the features are localized by topography, and form encrustations on prominences. They were formed during intervals of marine transgression caused by glacioeustatic rise of sea level. The subreef banks were inundated about 13,000 to 9,000 year B. P. and the reef growth has occurred since about 9,000 B. P. and thus are Late Holocene or Recent in age.—HRC

00771 **Logan, Brian W.** (and others). Carbonate sediments and reefs, Yucatán shelf, Mexico: Am. Assoc. Petroleum Geologists Mem. 11, p. 1–198, illus., tables, 1969.

The series of papers discussing these carbonate sediments and reefs are divided into two parts: the late Quaternary carbonate sediments of the Yucatán shelf and the coral reefs of the Yucatán shelf. Each part is cited separately and together they form part one of a three-part volume devoted to the geology of the Caribbean and Florida area.—HRC

00643 **Loney, R. A.; Himmelberg, G. R.; Coleman, R. G.** Structure and petrology of the peridotite at Burro Mountain, California [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 37, 1969.

Long, Austin. *See* Grey, D. C. 00831

Long, Austin. *See* Mielke, James E. 00837

00645 **Lovenburg, Mervin F.** Significant faunal mixing and informational losses due to seaweed (kelp) transportation [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 38, 1969.

00833 **Lowdon, J. A.; Wilmeth, R.; Blake, W., Jr.** Geological Survey of Canada radiocarbon dates VIII: Radiocarbon, v. 11, no. 1, p. 22–42, table, 1969.

Dates are listed for archeologic samples from eastern, western, and northern Canada, and the Arctic Archipelago.—MCM

00646 **Lowe, Donald R.** Late Mesozoic tectonic development of western California [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 38–39, 1969.

06908 **Lowell, Brent; West, Terry R.** A topographic map of the bedrock surface of Tippecanoe County, Indiana as drawn by a computer [abs.]: Indiana Acad. Sci. Proc. 1967, v. 77, p. 229–230, 1968.

Lowell, J. D. *See* Guilbert, J. M. 06839

06995 **Lufkin, Nat.** Differences between field and laboratory determinations of pH of some ground waters in eastern South Dakota [abs.]: South Dakota Acad. Sci. Proc. 1968, v. 47, p. 350, 1968.

00840 **Luft, Stanley J.** Geologic map of the Independence quadrangle, Kenton and Boone Counties, Kentucky: U.S. Geol. Survey Geol. Quad. Map GQ–785, scale 1:24,000, section, text, 1969.

Limestone, used locally as road metal, has been mined from the Fairview and Kope Formations in the Independence quadrangle. The area is largely untested for oil and gas. Sinkholes are mostly small and shallow, and of minor engineering and agricultural consequence. In the northern section, the lower 140 feet of the exposed Kope Formation consists largely of soft, easily deformed shale; particularly after heavy rains, stream banks and steep cuts are subject to slumping. A considerable part of the uplands area is covered by residual soil or glacial drift of unknown thickness, but foundations for small dwellings seldom reach bedrock.—MCM

06878 **Lutton, Richard.** Review of empirical slope data [abs.]: Mining Eng., v. 20, no. 8, p. 25, 1968.

06847 **Lutzen, E. E.** Detecting potential problem areas in quarries with portable geophysical equipment [abs.]: Mining Eng., v. 20, no. 12, p. 54–55, 1968.

06848 **Mabey, D. R.; Robinson, E. S.; Davis, W. E.** Regional aeromagnetic surveys in Nevada [abs.]: Mining Eng., v. 20, no. 12, p. 58, 1968.

MacDonald, Robert B. *See* Prokopovich, Nikola P. 00818

00647 **MacLeod, Norman S.** Differentiation in a granophyric ferrodiabase sill, central Oregon Coast Range [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 39, 1969.

07067 **Maher, John C.; Applin, Esther R.** Correlation of subsurface Mesozoic and Cenozoic rocks along the eastern Gulf Coast: Am. Assoc. Petroleum Geologists Cross Sec. Pub. 6, 29 p., illus., table, 1968.

An 800-mile cross section along the Gulf coastline east of New Orleans, and four intersecting it that cross parts of Mississippi, Alabama, Florida and Georgia are presented with text, to summarize current concepts of stratigraphic equivalence, point out regional differences in nomenclature, resolve certain discordances, and focus attention on problem areas. The region, both coastal plain and continental shelf, is underlain by an estimated 645,000 cu mi of Mesozoic and Cenozoic sediments, mostly marine. Correlation, based on available cores, electric logs, samples, and well data, was approached from marine facies in Mississippi through deep wells near the coastline, where microfossil zones are well documented, eastward and south to the Florida Keys, and from clastic outcrops at the Fall Line down dip through shallow wells to the deep coastline wells. Paleontological data and reported unit tops were plotted on electric-log strips.—GDC

06879 **Malott, D. F.** Uses of geophysics in subsurface surveying [abs.]: Mining Eng., v. 20, no. 8, p. 28A, 1968.

Mamay, Sergius H. *See* Scholl, David W. 00906

06935 **Mamet, B. L.** Sur une microfaune du Viséen Supérieur de Terre-Neuve [with English abs.], *in* Éditions spéciales du centenaire, 1868-1968—Sciences de la terre: Naturaliste Canadien, v. 95, no. 6, p. 1357-1372, illus., table, 1968.

The Crabbs and Jeffrey Limestones (Codroy Group), studied in their type localities (St. Georges bay, Newfoundland) yield an abundant and characteristic Late Visean microfauna (zone 16, late Late Visean). Although this fauna bears some resemblance to the Tethyan fauna, it has great similitude with the Arctic realm as well. Most of the species common to Newfoundland and western Europe are also found in northern Siberia, Alaska, Yukon and the Canadian Arctic Islands; hence, these species are indicators of free "cosmopolitian" exchanges in the Northern Hemisphere, more than of preferential exchanges between the two sides of the palaeo-Atlantic.

Mansfield, Charles P. *See* Cowan, Darrel S. 00704

00863 **Mariano, Anthony Nick.** A study of chalcopyrite as a derivative structure of sphalerite [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 29, no. 7, p. 2495B, 1969.

Marlow, Michael S. *See* Scholl, David W. 00906

Marr, G. E., 3d. *See* Campbell, W. J. 06833

00838 **Marsters, Beverly; Spiker, Elliott; Rubin, Meyer.** U.S. Geological Survey radiocarbon dates X: Radiocarbon, v. 11, no. 1, p. 210-227, 1969.

This list contains the results of measurements made during 1967 and 1968 on samples from eastern, central, and western United States, Alaska, the Mid-Atlantic Ridge, Atlantic Ocean, continental shelf of northeastern United States, Blake Plateau, Austria, Dominica Island (British West Indies), Caroline Islands, and Hawaii. MCM

06927 **Martignole, Jacques.** Sur la formation d'anorthosites par différenciation mécanique d'un magma basaltique contaminé [with English abs.], *in* Éditions spéciales du centenaire, 1868-1968—Sciences de la terre: Naturaliste Canadien, v. 95, no. 6, p. 1231-1242, illus., 1968.

Detailed studies on a small noritic complex of the Grenville Province near Shawinigan, Quebec, have shown that both mechanical differentiation and assimilation of pelitic gneisses could be invoked in the formation of anorthosites. The sheet-like Shawinigan Complex is folded in an open syncline, in the axis of which the maximum fractionation can be seen; norites at the bottom are overlain by leuconorites which grade upward into genuine anorthosites. A gravitational separation is suggested and filter-pressing may have been active. Mafics crystallized first in some places. The chilled margin is a magnesium-rich quartz-bearing rock, resulting perhaps from contamination of the basaltic magma by assimilation of aluminous gneisses. Pelitic assimilation favors early plagioclase formation; later folding consolidated it as anorthosite.—*from* Author's abstract

00832 **Martin, J. R.; Goodell, H. G.** Florida State University radiocarbon dates III: Radiocarbon, v. 11, no. 1, p. 15–21, 1969.

Age calculations in this list include results since January 1967 on geologic samples from the southeastern United States Atlantic shelf, Bahamas, Florida, and the Antarctic Ocean; and archeologic samples from Florida.—MCM

00648 **Marzolf, John.** Regional stratigraphic variations in primary features of the Navajo Sandstone, Utah [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 40, 1969.

06962 **Matich, M. A. J.; Douglas, M. C.** Stability of cuts in overconsolidated clay on the Don Valley Parkway, *in* Australian–New Zealand Conf. on Soil Mechanics and Found. Eng., 5th, Aukland, 1967, Proc.: Petone, New Zealand, Sigma Print Ltd., p. 288–295, illus.; discussion p. 303–304 [1968?].

This paper describes the investigation of a slide which occurred in a deep cut slope at Minton Place on the Don Valley Parkway, Toronto, Canada, and the remedial measures that were applied. The cut is predominantly in heavily over-consolidated clay and the slide occurred four years after construction. A detailed description of the soil conditions is given, together with the results of laboratory tests and examination of the failure zone during reconstruction. Instability occurred in a few other slopes in similar soil conditions and these are briefly discussed.—Authors' abstractv

Mattson, L. A. *See* Owens, John S. 06881

May, B. T. *See* Farrell, W. E. 00925

May, J. T. *See* Rosenbaum, J. B. 06855

00765 **McBirney, Alexander R.; Bass, Manuel N.** Geology of Bay Islands, Gulf of Honduras, *in* Tectonic relations of northern Central America and the western Caribbean: Am. Assoc. Petroleum Geologists Mem. 11, p. 229–243, illus., tables, 1969.

The islands are on the emergent crest of a narrow ridge on the south side of the Bartlett Trough. On Utila, alkaline basalt has erupted through Quaternary coral reefs, the oldest rocks exposed. On Roatán, metamorphic rocks of unknown age are overlain by pre–Tertiary limestone and conglomerate, with serpentinite intruded along thrust planes. Guanaja is composed of metamorphosed graywacke, silty shale, and chert which grade into sodic granite; hornblende gabbro is associated with serpentinite and aplite dikes. One set of faults on Roatán and Guanaja parallels the escarpment of the trough; clear evidence of lateral displacement is lacking, but vertical movement, in very recent times, is evident. Other faults dip steeply and are oriented at high angles to the trough. On Roatán thrust faults appear important. Folding axes in the metamorphic rocks plunge west-southwest parallel with the trough.—*from* Authors' abstract

00768 **McBirney, Alexander R.; Bass, Manuel N.** Structural relations of pre–Mesozoic rocks of northern Central America, *in* Tectonic relations of northern Central America and the western Caribbean: Am. Assoc. Petroleum Geologists Mem. 11, p. 269–280, illus., table, 1969.

Ultramafics of the Central Guatemalan Cordillera are the oldest in the basement sequence and possibly are mantle rocks. Serpentinized peridotite contains anorthosite dikes which may be from partial melting; they may be roots of larger granitic intrusions. The Chuacús series, oldest metasediments and possibly Precambrian but probably younger with inherited 1,075 m.y. old zircons were metamorphosed and intruded by Rabinal Granite 345 m.y. ago. Matanzas Granite, if correlative with Rabinal, shows one or more episodes of post–Devonian metamorphism, the latest being heating in latest Cretaceous or early Tertiary. El

Tambor Formation, tentatively a Chuacús facies, could be early Paleozoic. Previous models cannot explain the distribution of Paleozoic rocks, but similarities to rocks of the Southern Appalachians could support continental drift.—*from* Authors' abstract

00772 **McBirney, Alexander R.** (editor). Tectonic relations of northern Central America and western Caribbean—The Bonacca Expedition: Am. Assoc. Petroleum Geologists Mem. 11, p. 199–268, illus., tables, 1969.

The principal objective of the Bonacca Expedition was to complete an oceanographic survey of the western end of the Bartlett Trough, the most important structural feature of the northern Caribbean, and a geologic reconnaissance of three islands in the Gulf of Honduras adjacent to its southern escarpment. Results of these studies are assembled here together with discussions of the regional geology. The six papers are cited separately. The region is of importance because of the coalescence in the northwestern Caribbean and adjacent parts of Guatemala and northern Honduras of the Antillean and the Central American mountain systems. Both systems have the principal elements of island-arcs: laterally migrating chains of andesitic volcanoes with parallel trenches, zones of seismic activity, gravity anomalies, and broad, low backlands.—HRC

McCain, J. F. *See* Turner, J. D. 06966

McCain, J. F. *See* Newton, J. G. 07075

06849 **McCarthy, J. H.** Experiments with mercury in soil gas and air applied to mineral exploration [abs.]: Mining Eng., v. 20, no. 12, p. 46–47, 1968.

06850 **McClain, William C.; Bradshaw, R. Lewis.** The disposal of solidified radioactive wastes in salt mines [abs.]: Mining Eng., v. 20, no. 12, p. 60, 1968.

07084 **McClements, Robert, Jr.** The Athabasca Tar Sands, *in* Dusters and gushers—The Canadian oil and gas industry (J. H. Hilborn and Canadian Petroleum, editors): Toronto, Ontario, Pitt Publishing Co. Ltd., p. 167–175, illus., 1968.

Tar, or volatile-free petroleum, occurs as a cement in the sandstones of the McMurray Formation of Cretaceous age in northern Alberta. The formation has a gentle westerly dip and so is exposed extensively at the surface. The deposits underlie over 30,000 square miles, and the concentration of oil in the sands is estimated to be over 600 billion bbls, of which 300 billion can be recovered by presently-known methods. A discussion of the recovery problems and future potential is described also.—HRC

00881 **McCracken, Willard A.** Sedimentary structures and paleocurrent analysis of Sespe Formation, Ventura basin, California [abs.]: Am. Assoc. Petroleum Geologists Bull., v. 53, no. 2, p. 463, 1969.

00737 **McDougall, Ian; Stipp, J. J.** Potassium-argon isochrons [abs.]: EOS (Am. Geophys. Union Trans.), v. 50, no. 4, p. 330, 1969.

McKee, Edwin H. *See* Noble, Donald C. 00641

00649 **McKee, Edwin H.** Fish Creek Mountains volcanic center, Lander County, central Nevada [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 41, 1969.

McKee, Edwin H. *See* Blank, H. Richard. 00679

00729 **McKeown, F. A.; Dickey, D. D.; Brethauer, G. E.** Some characteristics of strain changes related to nuclear explosions [abs.]: EOS (Am. Geophys. Union Trans.), v. 50, no. 4, p. 249, 1969.

McManus, Dean A. *See* Venkatarathnam, K. 00912

McManus, Dean A. *See* Kelley, James C. 00917

McWilliams, J. R. *See* Willard, R. J. 00968

07074 **McWilliams, R. G.; Scott, J. C.; Golden, H. G.; Avrett, J. R.** Water availability, Crenshaw County, Alabama: Alabama Geol. Survey Map 69, scale about 1 in. to 2 mi., section, separate text, 1968.

Major aquifers in Crenshaw County are: major northern—sand beds in Eutaw Formation, yield 1 mgd, excessively mineralized in central and southern sections; major central—sand beds in Ripley Formation, yield 2 mgd in central and southern parts, a source of domestic supply in northern part and excessively mineralized in extreme south; and major southern—porous limestone in Clayton and Porters Creek Formations, yield 4 mgd in central and southern sections. Industrial and municipal supplies can be obtained in several sections of the county. Hardness and objectionable amounts of iron are widespread problems. The text includes tabulated information on geologic units and their water-bearing characteristics, records of drilled wells, and chemical analyses of water from wells.—MCM

00864 **McWilliams, Robert Gene.** Paleogene stratigraphy and biostratigraphy of central-western Oregon [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 29, no. 7, p. 2495B–2496B, 1969.

06799 **Meents, Wayne F.** Oil and gas industry in Illinois, 1968: Urbana, Ill., Illinois State Geol. Survey, scale about 1 in. to 8 mi., 1968.

Mehnert, H. H. *See* Noble, Donald C. 06808

07026 **Mclankholina, Ye. N.** A sravnitel'noy tektonike zapadnogo Sakhalina, Khokkaydo, Tayranya i Kalifornii [with English abs.]: Geotektonika 1968, no. 2, p. 32–50, illus., 1968; English translation, Geotectonics 1968, no. 2, p. 84–92, illus., 1968.

A comparative study of structures in western Sakhalin and Hokkaido, western Taiwan, and California has identified, in the Circumpacific belt of Cenozoic geosynclines, long linear troughs, asymmetrical in structure, along the boundary with Mesozoic folded structures. These external troughs originated in the last stages of geosynclinal sedimentation at the time of principal Mesozoic folding, and their development, unlike the interior portions of the geosynclines, was long and quiescent, extending through Cretaceous, Paleogene, and Neogene. The principal deformation of these structures occurred at the close of the Neogene and onset of Quaternary time; possibly the closing of troughs and growth of folds is still continuing.—VSN

Mello, James F. *See* Minard, James P. 00752

Melson, William G. *See* Duncan, John R. 00723

00746 **Melson, William G.; Simkin, Thomas; Fiske, Richard S.; Moore, James G.; Decker, Robert W.** Major volcanic eruptions of 1968—Preliminary contributions to petrology and volcanology [abs.]: EOS (Am. Geophys. Union Trans.), v. 50, no. 4, p. 344, 1969.

00650 **Melton, William G.** A new Pennsylvanian fish fauna from central Montana [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 41, 1969.

00976 **Merewether, E. A.; Haley, Boyd R.** Geology of the Coal Hill, Hartman, and Clarksville quadrangles, Johnson County and vicinity, Arkansas: U.S. Geol. Survey Prof. Paper 536-C, p. C1–C27, illus., tables, geol. map, 1969.

Sedimentary rocks penetrated by wells drilled for gas in the area range in age from Ordovician to Pennsylvanian. Pennsylvanian shale, siltstone, sandstone, and coal and Pleistocene and Recent terrace deposits and alluvium are exposed. The rocks are folded into gently dipping generally east-trending anticlines and synclines and

are broken by normal faults striking generally east. Natural gas, coal, building stone, gravel, sand, and clay are of commercial importance. The reported potential production of gas (Oct. 1, 1964) is about 331 million cubic feet per day. The Lower Hartshorne coal bed of Pennsylvanian age, the only coal bed of economic interest, has approximately 248 million short tons of remaining reserves.—EAM

Merrill, R. H. *See* Wisecarver, D. W. 06862

00852 **Merritt, Andrew Hutcheon.** Engineering classification for in-situ rock [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 29, no. 7, p. 2423B, 1969.

00910 **Merschat, Walter R.** Lower Tertiary paleocurrent trends, Santa Cruz Island, California [abs.]: Am. Assoc. Petroleum Geologists Bull., v. 53, no. 2, p. 461, 1969.

00837 **Mielke, James E.; Long, Austin.** Smithsonian Institution radiocarbon measurements V: Radiocarbon, v. 11, no. 1, p. 163–182, 1969.

Included in this list are analyses made during 1967 and the first half of 1968 on archeologic samples from eastern United States, northern Great Plains, Cuba, Mexico, Colombia, Ecuador, and Brazil; geologic and paleontologic samples from the Canadian Arctic, United States, Alaska, Brazil, and Israel; and geochemical samples from the Columbia River. A correction is given for an error in list IV (ibid., v. 9, p. 376, 1967).—MCM

Miles, Robert D. *See* Turner, A. Keith. 06913

06971 **Miller, D. N., Jr.** Southern Illinois earthquake 1968: Earth Sci. Bull., v. 1, no. 4, p. 15–17, illus., 1968.

In the earthquake of November 9, 1968, felt throughout the central states, most damage was slight and restricted to within 100 miles of the epicenter 10 to 12 miles north of Harrisburg, Ill.; only one surface crack is known, near Marion, Ill. Strongest since the Vincennes, Indiana quake in 1877, and less severe than the New Madrid earthquake of 1811, its epicenter is alined with theirs in the northeast southwest trending New Madrid Zone, which is intersected north of Cairo by an Eastern Ozark Zone that trends northwest-southeast. The gently rolling Harrisburg terrain overlies at least 12,000 feet of sedimentary rocks near the deepest part of the Fairfield basin, cut by several intersecting major fault systems. Monitor seismic stations may record enough aftershock data to fix the focal point.—GDC

Miller, Fred K. *See* Clark, Lorin D. 07057

00651 **Miller, Gerald M.** Western extent of mid-Cretaceous thrusting in Whatcom and Skagit Counties, Washington [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 42, 1969.

Miller, Lee D. *See* White, Donald E. 00749

06917 **Miller, Louis V.** An investigative study of six Indiana coals: Indiana Acad. Sci. Proc. 1967, v. 77, p. 299–304, illus., tables, 1968.

Proximate and ultimate analyses of 21 coal samples from six Indiana coals have been determined. Total sulfur in the "whole" coal is compared with the total sulfur retained in the "coke-button" after pyrolysis at 950°C and with the total sulfur retained in the ash after combustion at 750°C.—Author's abstract

00930 **Miller, Richard H.** Synodic month—Variations in the geologic past: Science, v. 164, no. 3871, p. 67–68, 1969.

The value of 31.56±0.74 days for the synodic month in the Upper Cambrian is used together with a maximum in the expected number of days in a synodic month to argue that solar tidal dissipation is important in the dynamics of the Earth-Moon system and that the moment of inertia of the Earth cannot have been much larger than it is now. The tendency of the measurements to remain near 30 days may be a resonance effect.—Author's abstract

06900 **Miller, Wade E.** Occurrence of a giant bison, *Bison latifrons*, and a slender-limbed camel, *Tanupolama*, at Rancho La Brea: Los Angeles County Mus. Contr. Sci., no. 147, 9 p., illus., table, 1968.

Tanupolama is recognized as a new constituent in the Rancho La Brea fauna. A previously overlooked record of *Bison latifrons* is confirmed by additional material and its association with *Bison antiquus* is noted for the first time. The geographic range of the former species of *Bison* is extended to southern California and its chronologic range into later Wisconsin time.—Author's abstract

00752 **Minard, James P.; Owens, James P.; Sohl, Norman F.; Gill, Harold E.; Mello, James F.** Cretaceous-Tertiary boundary in New Jersey, Delaware, and eastern Maryland: U.S. Geol. Survey Bull. 1274-H, p. H1-H33, illus., tables, 1969.

The nature of the Cretaceous-Tertiary boundary in New Jersey has been in dispute for at least 75 years. Recent detailed geologic mapping and reconnaissance in most of the inner part of the Coastal Plain of New Jersey, Delaware, and eastern Maryland have enabled the authors to show the unconformable nature of the boundary in this region. The thinning of the stratigraphic section, the pinchout of some units in outcrop, and the overlap of the basal Tertiary on progressively lower beds in the Cretaceous section from northeast to southwest are evident. Recognition of the unconformity, distinguishing lithologies, and cyclical nature of the Coastal Plain formations allows for closer correlation of the formations in New Jersey with those in Delaware and eastern Maryland.—JPM

00652 **Minch, John A.** A depositional contact between the pre-batholithic Jurassic and Cretaceous rocks in Baja California, Mexico [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 42-43, 1969.

06805 **Mining Engineering.** Nickel: Mining Eng., v. 20, no. 10, p. 69-114, illus., 1968.

The story of nickel—exploration through refining—is brought up to date.—MAC

00773 **Moench, Robert H.** The Quimby and Greenvale Cove Formations in western Maine: U.S. Geol. Survey Bull. 1274-L, p. L1-L17, illus., 1969.

The newly named Quimby and Greenvale Cove Formations in Franklin County, Maine, are composed of Upper Ordovician(?) clastic metasedimentary rocks. The Quimby Formation conformably overlies the Middle Ordovician Dixville Formation. The Quimby is divided into a lower graywacke member, about 1,000 feet thick, and an upper shale member, about 2,000 feet thick. The Greenvale Cove Formation conformably overlies the Quimby and is itself conformably overlain by the Lower Silurian(?) Rangeley Formation. The Greenvale Cove, 300-600 feet thick, is composed of interlaminated fine-grained metasandstone, metasiltstone, and metashale. Where the Greenvale Cove is exposed the Taconic disturbance is marked by the abrupt but conformable transition from the Greenvale Cove to the more coarsely clastic Rangeley.—RHM

00654 **Monger, J. W. H.** Upper Paleozoic eugeosynclinal rocks of northwestern British Columbia and south-central Yukon [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 43-44, 1969.

Monke, E. J. *See* Skaggs, R. W. 06899

Moore, Carleton B. *See* Yates, Ann M. 06999

06958 **Moore, Charles A.** Quantitative analysis of naturally occurring multicomponent mineral systems by X-ray diffraction [with French, German, and Russian abs.]: Clays and Clay Minerals, v. 16, no. 5, p. 325-336, illus., table, 1968.

A theory for the quantitative analysis of multicomponent mineral systems is presented and is verified for bicomponent and tricomponent systems using a variety of sample preparation techniques. Minerals studied include quartz, fluorite, kaolinite, glauconite, illite, and montmorillonite. Determination of linear interaction factors for mineral pairs is treated theoretically and experimentally. Emphasis is

placed upon techniques applicable to naturally occurring mineral systems. Four approaches are presented for determining linear interaction coefficients for various types of mineral systems. These approaches are applied to the experimental data and results are compared. Accuracy within two percent is common. Experimental techniques are discussed and a qualitative and quantitative error analysis presented.—*from* Author's abstract

00776 **Moore, D. M.; Henderson, D. M.** Mineralogic stratigraphic marker in White Pine Group, eastern Nevada: Am. Assoc. Petroleum Geologists Bull., v. 53, no. 3, p. 683–687, illus., 1969.

The upper three-fourths of the White Pine Group (Late Mississippian) at four widely separated and representative sections in eastern Nevada is characterized by illitic mixed-layer clay, whereas the lower fourth is characterized by well-crystallized illite and, at two of the four sections, by dolomite. These distinctive mineral assemblages meet at a sharply defined, easily determinable boundary that can serve as a stratigraphic marker within this thick, in places poorly exposed, commonly lithologically similar sequence. This boundary can be extended westward to a fifth section if one accepts that the clay minerals in the fifth locality have been affected by incipient metamorphism.—Authors' abstract

Moore, James G. *See* Melson, William G. 00746

Morgan, W. Jason. *See* Duncan, John R. 00723

Morris, David B. *See* Eimon, Paul I. 06871

00897 **Morris, G. B.; Raitt, R. W.; Shor, G. G., Jr.** Velocity anisotropy of upper mantle [abs.]: Am. Assoc. Petroleum Geologists Bull., v. 53, no. 2, p. 469–470, 1969.

Mortland, M. M. *See* Lai, T. M. 07015

00987 **Mose, Douglas, G.; Bickford, M. E.** Precambrian geochronology in the Unaweep Canyon, west-central Colorado: Jour. Geophys. Research, v. 74, no. 6, p. 1677–1687, illus., tables, 1969.

Precambrian rocks exposed in the Unaweep Canyon, west-central Colorado, include gneisses of probable metasedimentary origin, a batholith of coarse porphyritic granodiorite, a pluton of quartz monzonite, a pluton of granite, and dikes of granitic pegmatite and aplite. Field relations show that the batholith intruded the gneisses, that the two plutons intruded the batholith, and that all these units were intruded by the dikes. The following isochron ages have been obtained by Rb-Sr analyses of whole-rock samples: (1) batholith of quartz monzonite porphyry, 1694±108 m.y.; (2) biotite-muscovite granite pluton, 1472±57 m.y.; (3) muscovite quartz monzonite pluton, 1479±60 m.y.; (4) pegmatite dikes, 1408±52 m.y. These ages are consistent with numerous reports of igneous activity occurring at these times in Colorado and elsewhere in the southwestern United States.—Authors' abstract

00720 **Moulder, E. A.** Fresh water bubbles—A possibility for using saline aquifers to store water [abs.]: EOS (Am. Geophys. Union Trans.), v. 50, no. 4, p. 153, 1969.

Muehlberg, Gary E. *See* Fowler, Gerald A. 00891

Muffler, L. J. Patrick. *See* Honda, S. 00750

06896 **Muffler, L. J. Patrick; White, Donald E.** Origin of CO_2 in the Salton Sea geothermal system, southeastern California, U.S.A., *in* Internat. Geol. Cong., 23d, Prague, 1968, Proc., Symposium 2, Genesis of mineral and thermal waters: Prague, Academia, p. 185–194, illus., table, 1968.

The Salton Sea geothermal system is within the Cenozoic sandstone, siltstone and claystone of the Colorado River delta. Examination of drill hole cuttings indicates that original carbonates are destroyed and CO_2 liberated in two hydrothermal metamorphic reactions that affect the sediments at depth in the high temperature

environment of the geothermal system. At 150° to 200°C and depths greater than 300 m, dolomite reacts with kaolinite to produce chlorite, calcite and CO_2. In zones of most intense alteration at 300° to 320°C and depths greater than 900 m, CO_2 is liberated by the breakdown of calcite. It is inferred that the CO thus liberated from the sediments migrated upward and in part laterally to the shallow CO_2 reservoirs.—*from* Authors' abstract

00824 **Mullens, Thomas E.** Geologic map of the Causey Dam quadrangle, Weber County, Utah: U.S. Geol. Survey Geol. Quad. Map GQ-790, scale 1:24,000, sections, text, 1969.

The Causey Dam quadrangle contains major deposits of phosphate rock in the Phosphoria, Park City, and Humbug Formations. Minor deposits of manganese minerals and major deposits of gravel are not presently of economic importance. Quartzite gravel is widely distributed in surficial deposits, but there is no local market. Sandy siltstone from the Wasatch and Evanston Formations was used in constructing Causey Dam, an earth-fill structure.—MCM

00631 **Muller, J. E.; Jeletzky, J. A.** Sedimentation and faunal zonation of Upper Cretaceous Nanaimo Group, western British Columbia [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 44–45, table, 1969.

06912 **Murdock, Stanley H.; Powell, Richard L.** Subterranean drainage routes of Lost River, Orange County, Indiana: Indiana Acad. Sci. Proc. 1967, v. 77, p. 250–255, illus., table, 1968.

The upper Lost River watershed consists of a drainage net of sinking streams, tributary to the main stream through subterranean channels, which developed during early to middle Pleistocene beneath a surface of Tertiary age. Material eroded from Mitchell Plain alluviated the subterranean systems. Fluorescein was used to trace these channels. Subsurface water in part of the basin on Mitchell Plain, descends 100 to 150 feet to resurge at the rise of Lost River and the Orangeville Rise. Drainage in a 14.5 sq mi area in the Crawford Upland is diverted downdip beneath the topographic divide into Lick Creek about 80 feet below the sinks. Drainage from Dry Branch, a karst valley in the Crawford Upland, follows strike and descends 90 feet to the Orangeville Rise.—*from* Authors' abstract

00636 **Murphy, Michael A.** Barremian–Aptian correlations and an Aptian unconformity in the Budden Canyon Formation, Shasta County, California [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 46, 1969.

06880 **Murphy, V. J.; Holt, R. J.** Seismic velocity and moduli measurements of near surface materials [abs.]: Mining Eng., v. 20, no. 8, p. 28A, 1968.

00841 **Myers, Donald A.** Geologic map of the Escabosa quadrangle, Bernalillo County, New Mexico: U.S. Geol. Survey Geol. Quad. Map GQ-795, scale 1:24,000, 1969.

Naiman, C. S. *See* Wilkins, R. W. T. 00972

06886 **Nair, Keshavan; Otus, Mahmut.** Structural stability of large cavities for Project Payette [abs.]: Mining Eng., v. 20, no. 9, p. 109, 1968.

06991 **Nash, J. Thomas.** Uranium deposits in the Jackpile Sandstone, New Mexico: Econ. Geology, v. 63, no. 7, p. 737–750, illus., tables, 1968.

Ultimate sources of uranium are believed to be either fluids from Morrison volcanoes (not demonstrable) or labile constituents in the Jackpile Sandstone. Petrographic studies indicate considerable pre-Dakota diagenesis, which would have made uranium in feldspars, heavy minerals, and volcanic debris available. Deposition of uranium occurred while host sandstone was near the surface during the pre-Dakota hiatus. Sedimentary permeability was the principal factor in distribution of ore and of the organic decomposition products that precipitated it.—WSW

00637 **Nations, J. Dale.** The fossil record of *Cancer* on the west coast of North America [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 46, 1969.

00967 **Natl.Adv. Comm.Research Geol.Sci.** Eighteenth annual report, 1967–1968—Annual review and reports of subcommittees: Canada Geol. Survey Paper 68-73, 99 p., 1969.

In addition to a general review of research grants, storage and retrieval of data, symposiums, conferences, and congresses, the bulk of the volume contains subcommittee reports on geophysical methods applied to geological problems; mineral deposits; mineralogy, geochemistry and petrology; Quaternary geology; scholarship and research training; storage and retrieval of geological data; stratigraphy, paleontology and sedimentology; and structural geology. An appendix lists research grants awarded in 1968–69.—MCM

00638 **Nayudu, Y. R.; Chastain, Charlette; Wienke, Sally M.; Latterell, Helen M.** Bathymetry and petrology of an unnamed seamount in the northeast Pacific [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 47, 1969.

Nelson, C. A. *See* Sylvester, A. G. 00792

Nelson, C. H. *See* Hopkins, D. M. 06844

06948 **Nelson, Robert S.** Tertiary deposits and morphology east flank Bighorn Mountains, Wyoming: Earth Sci. Bull., v. 1, no. 4, p. 19–24, illus., 1968.

Evidence of pre-Pleistocene drainage is preserved immediately west of Buffalo, Wyoming as relics of a pre-existing valley and alluvial gravel. This drainage corresponds in part with the present location of the North Fork of Clear Creek and Clear Creek. As interpreted from field and map relationships, this drainage was a major eastward flowing stream existing from the Eocene to the Pleistocene when it was rejuvenated as the present Clear Creek drainage by uplift of the core of the Big Horn Mountains.—Author's abstract

00639 **Nelson, Willis H.** White Mountain, northwestern Wyoming; not a volcanic center [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 47, 1969.

06851 **Neuerburg, G. J.** Detecting and tracing ore-bringers and ore-solution channels as a prospecting aid [abs.]: Mining Eng., v. 20, no. 12, p. 47, 1968.

Newell, M. F. *See* Rankin, D. W. 00740

07073 **Newton, J. G.; Golden, H. G.; Avrett, J. R.; Scott, J. C.** Water availability, Dale County, Alabama: Alabama Geol. Survey Map 64, scale about 1 in. to 2 mi., section, separate text, 1968

The northern major aquifer (upper 200 feet of Ripley Formation, Providence Sand, and Clayton Formation) and the southern major aquifer (Providence Sand and Clayton Formation) dip southward from their outcrop areas in Barbour and Pike Counties and underlie all of Dale County. The map indicates the depth below mean sea level of the base of aquifers that will yield 2 mgd. Locally hardness and objectionable amounts of iron are problems. The test includes tabulated data on geologic units and their water-bearing characteristics, records of drilled wells, and partial chemical analyses of water from wells.—MCM

07075 **Newton, J. G.; McCain, J. F.; Avrett, J. R.** Water availability, Henry County, Alabama: Alabama Geol. Survey Map 71, scale about 1 in. to 2 mi., section, separate text, 1968.

The major aquifer underlying Henry County, consisting of several beds of sand and limestone in the Providence Sand and Clayton Formation, is capable of yielding 2 mgd or more in all but the northernmost section. Two additional aquifers, sands in the Ripley Formation and the Tuscaloosa Group, are potential sources of large

supplies especially in the northern area. Most units that crop out yield sufficient quantities to satisfy domestic needs. Hardness of ground water and objectionable amounts of iron are problems, but quality is generally satisfactory for most uses. In tabular form, the text summarizes data on geologic units and their water-bearing characteristics, records of wells and springs, chemical analyses of water from wells and springs, and streamflow and chemical quality data.—MCM

Niven, David W. *See* Gries, John Paul. 06890

NKomo, I. T. *See* Stacey, J. S. 06945

00640 **Noble, Donald C.** Energy of eruption, timing of subsidence, and the distribution and form of welded pyroclastic deposits [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 48, 1969.

00641 **Noble, Donald C.; McKee, Edwin H.; Creasy, John W.** Late Tertiary peralkaline volcanism in north-central Humboldt County, Nevada [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 48–49, 1969.

06808 **Noble, Donald C.; Sargent, K. A.; Mehnert, H. H.; Ekren, E. B.; Byers, F. M., Jr.** Silent Canyon volcanic center, Nye County, Nevada, *in* Nevada Test Site: Geol. Soc. America Mem. 110, p. 65–75, illus., tables, 1968.

Rocks of this late Miocene volcanic center, on eastern Pahute Mesa, consist chiefly of comendites with subordinate trachyte soda rhyolite and trachyte. Distinct and unusual mineralogy and trace- and major-element chemistry indicate close genetic relationship. First emplaced were numerous lava flows, domes and dikes over a 450 sq mi area, with most eruptions in the area of later caldera collapse. Two compound ash-flow sheets then erupted—the Tub Spring and Grouse Canyon members of the Belted Range Tuff; the latter covered 3,000 sq mi. Only the eastern third of Silent Canyon caldera is now exposed or reflected in overlying tuffs. This source of the Belted Range Tuff is indicated by: facies changes in the Grouse Canyon Member, thickness variations in underlying tuffs, one Grouse Canyon unit and thick later tuffs and lavas only near the caldera, and a concentric arc of small welded tuff vents outside it.—GDC

06818 **Noble, Donald C.** Kane Springs Wash volcanic center, Lincoln County, Nevada, *in* Nevada Test Site: Geol. Soc. America Mem. 110, p. 109–116, illus., table, 1968.

The Kane Wash Tuff, K-Ar dated 14 m.y., is the youngest ash-flow sequence in south-central Lincoln County. Its vent, in southern Delamar Range, is located by distribution, thickness and facies variations of individual units, evidence for caldera collapse, and petrographic and chemical similarity of pre- and post-collapse rocks. Covering 3,000 to 4,000 sq mi, its original volume was more than 200 cu mi. First erupted were lavas, then six or more Kane Wash ash-flow sheets. Collapse formed an 8-by-12-mi caldera, which was filled up by a complex of welded and nonwelded tuffs, lava flows, intrusives, and talus without apparent resurgence. Eruptives are mainly comendites, with trachytic soda rhyolite, trachyte, and basalt. Basin-range faulting has only slightly disturbed the caldera area.—GDC

00642 **Normark, W. R.; Piper, D. J. W.** Deep-sea fan valleys, past and present [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 49, 1969.

07058 **Oakes, E. L.; Bidwell, L. E.** Water resources of the Mississippi headwaters watershed, north-central Minnesota: U.S. Geol. Survey Hydrol. Inv. Atlas HA-278, 4 sheets, scale 1:250,000, text, 1968.

The four sheets include the following information: (1) hydrologic equation, water use, summary and conclusions; (2) ground-water availability; (3) surface water; and (4) water movement and quality. The ground-water reservoir contains the largest quantity of water available within the watershed; yields up to 500 gpm can be obtained at many places. Sources are outwash deposits, buried glacial aquifers, and Precambrian sedimentary bedrock. Most water is very hard and frequently contains excessive iron and manganese.—MCM

00836 **Ogden, J. Gordon, 3d; Hay, Ruth J.** Ohio Wesleyan University natural radiocarbon measurements IV: Radiocarbon, v. 11, no. 1, p. 137–149, tables, 1969.

This list, compiled from samples prepared since publication of list IV(1967), includes determinations through June, 1968 on geochemical and archeologic samples from Ohio, and on geologic samples from Ohio, Pennsylvania, Lake Erie, Massachusetts, and Indiana.—MCM

Oldershaw, A. E. *See* Beales, F. W. 00780

00633 **Oles, Keith F.** Cretaceous marine embayment in central Oregon [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 49–50, 1969.

00753 **Olive, Wilds W.; Finch, Warren I.** Stratigraphic and mineralogic relations, and ceramic properties of clay deposits of Eocene age in the Jackson Purchase region, Kentucky, and in adjacent parts of Tennessee: U.S. Geol. Survey Bull. 1282, 35 p., illus., tables, 1969.

Clay deposits in the Jackson Purchase region, Kentucky, and in adjacent parts of Tennessee occur as widely spaced lenses in the Wilcox, Claiborne, and Jackson Formations. Mineralogic and size analyses and ceramic tests indicate that undeveloped clay bodies from various parts of the Jackson Purchase region and from different parts of the stratigraphic section have potential value for use in ceramics. Of samples studied, those with the desirable characteristics of fine texture, high kaolinite and low quartz content, and containing little or no montmorillonite are from the Claiborne Formation. As indicated by pollen, most commercial clay deposits in Kentucky are of middle and late Claiborne age. The pollen types and lithologic relations suggest that the deposits accumulated as lenses in two ancient valleys.—WWO

00931 **Oliver, Jack.** Earthquake prediction—United States–Japan Cooperative Science Program: Science, v. 164, no. 3875, p. 92–93, 1969.

Recent progress in understanding the earthquake mechanism and its relation to earthquake prediction was discussed at a Joint Conference on Premonitory Phenomena Associated with Several Recent Earthquakes and Related Problems. The conference was held by the United States–Japan Cooperative Science Program at the U.S. Geological Survey's National Center for Earthquake Research in Menlo Park, Calif., from October 28 to November 1, 1968.—K.A.F.

00748 **O'Neil, James R.; Barnes, Ivan.** The nature of secondary dolomite formation [abs.]: EOS (Am. Geophys. Union Trans.), v. 50, no. 4, p. 347, 1969.

Orkild, P. P. *See* Ekren, E. B. 06795

06815 **Orkild, Paul P.; Byers, F. M., Jr.; Hoover, D. L.; Sargent, K. A.** Subsurface geology of Silent Canyon caldera, Nevada Test Site, Nevada, *in* Nevada Test Site: Geol. Soc. America Mem. 110, p. 77–86, illus., 1968.

Deep drilling on eastern Pahute Mesa has revealed a Tertiary volcanic section, locally over 14,000 feet thick, and has confirmed the structure of the Silent Canyon caldera, a rude ellipse measuring 10×14 miles and almost completely obscured by younger volcanics. Petrographic, chemical, and magnetic studies of the drill core revealed thick pre–caldera calc-alkalic lavas and tuffs; peralkaline rocks of the Silent Canyon center including Belted Range Tuff, downdropped 5,000 to 7,000 feet in caldera collapse; subsequent partial fill in the east by genetically related peralkaline rocks, and later in the west by unrelated calc-alkaline rocks. Subsidence was probably renewed during their eruption. Evidence shows that the caldera was topographically low during deposition of later ash-flow sheets from other volcanic centers.—GDC

Orkild, Paul P. *See* Byers, F. M., Jr. 06816

00759 **Orville, Philip M.** A model for metamorphic differentiation origin of thin-layered amphibolites: Am. Jour. Sci., v. 267, no. 1, p. 64–86, illus., tables, 1969.

It is shown that the composition data do not require an igneous parent for amphibolite interlayered in metasediments. Any rock, whatever its origin, composed chiefly of hornblende, with a subordinate amount of plagioclase will approximate a basaltic composition, since the composition field for the two-phase assemblage hornblende–plagioclase closely mimics the composition field of basic igneous rocks. Chemical reaction between carbonate-rich rock and carbonate-free pelitic rocks under open system conditions can produce a hornblende–plagioclase assemblage from a wide range of carbonate-rich pelite compositions. In this way carbonate-rich layers in pelitic rocks, a common sedimentary assemblage, would be related to amphibolite layers in pelitic schist and gneiss, a common metamorphic assemblage.—*from* Author's abstract

Osada, Kaio. *See* Tanaka, Teiji. 07049

00911 **Osborn, B. C.** Field geology in a marine environment[abs.]: Am. Assoc. Petroleum Geologists Bull., v. 53, no. 2, p. 461, 1969.

00751 **Ostrom, Meredith E.** Champlainian Series (Middle Ordovician) in Wisconsin: Am. Assoc. Petroleum Geologists Bull., v. 53, no. 3, p. 672–678, illus., 1969.

Champlainian rocks in the upper Mississippi Valley area consist of a unit of predominately clastics and an overlying unit of predominately carbonates. The clastic unit has been named the Ancell Group and the carbonate unit has been designated the "Ottawa Megagroup." The Glenwood Formation is a sequence of transitional beds assigned to the top of the Ancell Group. The upper boundary of the Glenwood Formation in southwestern Wisconsin is redefined to coincide with the base of the Chana Member of the Pecatonica Formation. The name Ancell Group is retained for the clastic unit. The name Sinnipee Group is proposed for the carbonate rocks between the Glenwood Formation and the Maquoketa Shale.—*from* Author's abstract

Otus, Mahmut. *See* Nair, Kshavan. 06886

00634 **Ovenshine, A. Thomas; Eberlein, G. Donald; Churkin, Michael, Jr.** Paleotectonic significance of a Silurian–Devonian clastic wedge, southeastern Alaska [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 50, 1969.

00635 **Ovenshine, A. Thomas; Webster, Gary D.** Silurian conodonts from southeastern Alaska [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 51, 1969.

Owens, James P. *See* Minard, James P. 00752

06881 **Owens, John S.; Trost, L. C.; Mattson, L. A.** Application of geology at the Butler and National taconite operations on the Mesabi Range [abs.]: Mining Eng., v. 20, no. 8, p. 27, 1968.

Oxburgh, E. R. *See* Turcotte, D. L. 00922

00632 **Page, Ben M.** Relation between ocean floor spreading and structure of the Santa Lucia Range, California [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 51–52, 1969.

06906 **Pageau, Yvon.** Nouvelle faune ichthyologique du Dévonien moyen dans les Grès de Gaspé (Québec)—Pt.] 1, Géologie et écologie [with English abs.], *in* Éditions spéciales du centenaire, 1868–1968—Sciences de la terre: Naturaliste Canadien, v. 95, no. 6, p. 1459–1497, illus., tables, 1968.

The Gaspé Sandstones outcrop in important areas particularly around Gaspé Bay and in the middle of the Gaspé Peninsula. The total thickness of the sandstones is estimated at or about 10,000 feet. Only two species of fossil fish have heretofore been described from the Gaspé Bay area. Eighteen species have been found in the bay area of which twelve are new genera and species. This article deals with the geology of the Gaspé sandstones in general and particularly with the outcrops in the bay area, taking into account the new vertebrate fauna. The Battery Point

Formation of the Gaspé Sandstones must be regarded as lower Middle Devonian.—*from* Author's abstract

06911 **Palmer, Arthur N.** The survey of Blue Spring Cave, Lawrence Co., Indiana: Indiana Acad. Sci. Proc. 1967, v. 77, p. 245–249, illus., 1968.

With 18.8 mi of surveyed passage, the cave is the longest in Indiana and sixth longest in the world. Results of a compass-and-tape survey show that it is the conduit for a ground-water flow system draining about 10 sq mi of the Mitchell Plain southwest of Bedford, and discharging at Blue Spring on the East Fork of White River; maximum observed discharge in the main stream is 300,000 gpm. Little correlation exists between cave passage and surface sinkholes, except where collapse sinkholes have developed in areas of widespread passage breakdown. Most sinkholes and sinkhole ponds appear to contribute water to the cave system through narrow lateral joints and fissures; some sinkhole ponds are directly over air-filled cave passages. The cave developed in three levels, as East Fork became entrenched into Mitchell Plain, with a possible fourth level existing below present base level.—*from* Author's abstract

06882 **Palmer, H. D.** Shallow marine geophysical surveys for engineering projects [abs.]: Mining Eng., v. 20, no. 8, p. 28A, 1968.

Papike, J. J. *See* Clark, Joan R. 07078

Parris, David C. *See* Green, Morton. 07000

Patterson, S. O. *See* Hughes, Judson B., Jr. 00921

Payne, Faith N. *See* Chase, Edith Becker. 07031

Peacor, Donald R. *See* Rouse, Roland C. 07005

00743 **Peck, Dallas L.** Density of molten lava in Alae Lava Lake, Hawaii [abs.]: EOS (Am. Geophys. Union Trans.), v. 50, no. 4, p. 339, 1969.

Peck, Dallas L. *See* Robertson, Eugene C. 00744

00880 **Perelman, David S.** Seismic response of structure-foundation systems [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 29, no. 7, p. 2423B–2424B, 1969.

00735 **Peselnick, Louis; Byerlee, James D.** Crack propagation under a uniaxial compressive stress [abs.]: EOS (Am. Geophys. Union Trans.), v. 50, no. 4, p. 325, 1969.

Peter, G. *See* Bassinger, B. G. 00923

Peterman, Zell E. *See* Coleman, Robert G. 00703

00821 **Peterman, Zell E.; Doe, Bruce R.; Prostka, Harold J.** Lead and strontium isotopes in rocks of the Absaroka volcanic field, Wyoming [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 52, 1969.

06852 **Peters, W. C.** Economics, geology, and the search for concealed ore deposits [abs.]: Mining Eng., v. 20, no. 12, p. 63, 1968.

Peterson, M. N. A. *See* Winterer, E. L. 07061

Peterson, Melvin N. A. *See* Field, A. J. 00905

00782 **Petkewich, Richard M.; Hoffman, Dale S.** The continental Tertiary Bozeman Group of the lower Beaverhead River Basin, Madison and Beaverhead Counties, Montana—Pt. 1, Stratigraphy and geologic history [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 52–53, 1969.

00815 **Petro, V. A.** Amphibolites from the Grand Forks West Half quadrangle of British Columbia [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 53, 1969.

Phillips, R. E. *See* Brown, D. A. 07042

00991 **Phinney, Robert A.; Cathles, Lawrence M.** Diffraction of P by the core—A study of long-period amplitudes near the edge of the shadow: Jour. Geophys. Research, v. 74, no. 6, p. 1556–1574, illus., tables, 1969.

Theoretical expressions for the amplitude of P waves in the neighborhood of the core shadow boundary have been formulated and evaluated by computer. Comparison with 2.5 sec data of Sacks confirms his determination of the shadow position at 96.5°. A square-root frequency scaling law is found for the high frequency diffraction pattern and permits the use of the Fresnel integral function at short periods. Long-period amplitude data for three paths have been spectrum-analyzed and compared against the theoretical amplitude dropoff going into the shadow. The agreement is about as good as the data will permit, and no indication is found at these periods of a low-amplitude defocused region at 90° to 96°, after diffraction has been accounted for.—Authors' abstract

Pierce, A. P. *See* Cannon, R. S. 06868

00816 **Pierce, R. W.; Ely, R. W.; Stieglitz, R. D.; Courtright, T. R.; Langenheim, R. L., Jr.** Upper Pogonip rock units in the Arrow Canyon Range, Clark County, Nevada [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 53–54, table, 1969.

Pierce, Richard L. *See* Scholl, David W. 00906

Pinder, George F. *See* Trescott, Peter C. 00722

00877 **Pinder, George Francis.** A numerical technique for aquifer evaluation [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 29, no. 7, p. 2514B, 1969.

Piper, D. J. W. *See* Normark, W. R. 00642

00774 **Pipiringos, G. N.; Hail, W. J., Jr.; Izett, G. A.** The Chinle (Upper Triassic) and Sundance (Upper Jurassic) Formations in north-central Colorado: U.S. Geol. Survey Bull. 1274-N, p. N1–N35, illus., table, 1969.

The Chinle and Sundance Formations occur on both flanks of the Park Range near Kremmling, north-central Colorado. The Chinle comprises three members and correlates with the Popo Agie Formation and the Bell Springs Member of the Nugget Sandstone of south-central Wyoming. It thins eastward beneath an unconformity at the base of the Sundance, but a lobate remnant crops out 6 to 20 miles northwest of Kremmling and extends eastward for an undetermined distance in the subsurface of Middle Park. The Sundance comprises four members, two of which are partly equivalent to the Entrada Sandstone and to the Curtis Formation of northwestern Colorado. Rapid facies changes and identifiable fossils are surprisingly widespread and common in the Sundance of this area.—GNP

Pistor, P. *See* Brockamp, B. 06956

00817 **Plummer, Charles C.** Dynamothermal contact metamorphism of the Chiwaukum Schist associated with the intrusion of the Mount Stuart batholith, Washington Cascades [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 54–55, 1969.

00865 **Plusquellec, Paul Lloyd.** Some ostracod genera of the subfamily Campylocytherinae [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 29, no. 7, p. 2496B, 1969.

00757 **Pollock, S. J.; Farrell, D. F.; Caswell, W. W.** Water resources of the Assabet River basin, central Massachusetts: U.S. Geol. Survey Hydrol. Inv. Atlas HA-312, scale 1:48,000, text, 1969.

Much of the most favorable area for ground-water development in the Assabet River basin is underlain by sand and gravel of relatively high permeability; however, fine-grained materials of low permeability exist both adjacent to and interlayered with the better aquifer materials. Further supplies may have to be developed from wells yielding 100–150 gpm throughout the basin. Chemical quality of the water is generally suitable for most uses although iron and manganese may be a problem locally. Great thicknesses of permeable materials adjacent to perennial streams offer the greatest potential for recovering the most water per well.—MCM

Pomeroy, Paul W. *See* Liebermann, Robert C. 00981

Pool, D. L. *See* Rollins, M. B. 07028

Poole, Forrest G. *See* Barnes, Harley. 06793

Poole, Forrest G. *See* Gordon, Mackenzie, Jr. 06810

Popenoe, Peter. *See* Behrendt, John C. 00775

07003 **Post, Austin S.** Effects on glaciers, *in* The great Alaska earthquake of 1964—Hydrology, Pt. A: Natl. Acad. Sci. Pub. 1603, p. 266–308, illus., tables, reprinted 1968; originally published 1967.

This paper is reprinted with minor changes from U.S. Geol. Survey Prof. Paper 544-D, 1967. *See* Abstracts of North American Geology for December 1967. MCM

06903 **Post, Donald F.; Ulrich, H. P.** Characterization of the Pembroke soils from Indiana: Indiana Acad. Sci. Proc. 1967, v. 77, p. 396–404, illus., tables, 1968.

Pembroke soils which have developed from high grade calcitic limestone, capped with a shallow loess overburden, were studied to determine changes in clay mineral composition and soil properties which occurred in the soil profile. Analysis showed a major clay mineral transformation from an illitic type in the parent rock to a mixed suite of clay minerals including a significant quantity of kaolinite. Special consideration is given to the genesis of the clay minerals.—Authors' abstract

06919 **Post, Donald F.; White, Joe L.** Quantitative mineralogical analysis of soil clays: Indiana Acad. Sci. Proc. 1967, v. 77, p. 405–411, table, 1968.

Quantification of the components in the $<.0\mu$ fraction of soils is at best semi-quantitative in nature. Degree of crystallinity, particle size distribution, and chemical composition greatly affect results obtained from any quantitative study. It is best to use more than one diagnostic method to make quantitative estimations.—Authors' abstract

Potos, Chris. *See* Ross, Curtis. 07093

06930 **Pouliot, Gaston.** Paramorphisme du quartz dans le granophyre de l'intrusion de Muskox, T.N.O. [with English abs.], *in* Éditions spéciales du centenaire, 1868–1968—Sciences de la terre: Naturaliste Canadien, v. 95, no. 6, p. 1277–1292, illus., table, 1968.

The roof zone of this stratified intrusion is in places characterized by the downward sequence: intrusive breccia—granophyre—mafic granophyre—granophyric gabbro. Several occurrences of blade-like and rod-like quartz within these rocks indicate that much of the quartz crystallized originally as tridymite. Textures resulting from the inversion of tridymite to quartz appear often to have been overlooked. Hydrothermal experiments using granophyre fragments indicate that symplectites in the granophyre formed by simultaneous crystallization of cotectic mixtures of quartz (or tridymite) and potash feldspars. The crystallizing of tridymite in the

granophyre suggests that temperatures of crystallization were in the neighborhood of 900°C and that the magmatic environment was relatively dry.—*from* Author's abstract

07004 **Powell, A. R.** Use of the Log–Test–Log technique as an aid in formation evaluation: Log Analyst, v. 9, no. 2, p. 7–13, illus., 1968.

The Log–Test–Log drill stem test supplements present evaluation techniques in the location of reservoirs and determination of their productive capability. The equipment includes a conventional drill stem test tool and a down-hole self contained logging apparatus. The log portion of the tool provides a combination of Gamma–Ray and resistivity curves. The addition of the test logs provides a detailed and more accurate analysis of net pay, productivity, and lithology resulting in a considerable savings in drilling and completion costs. Field samples from the Cedar Creek anticline (Montana) and Reno Area (Wyoming) are presented to illustrate these results.—Author's abstract

06910 **Powell, Richard L.** The geology and geomorphology of Wyandotte Cave, Crawford County, Indiana: Indiana Acad. Sci. Proc. 1967, v. 77, p. 236–244, illus., 1968.

The cave consists of about 5.5 mi of known passages at two major levels within strata of the upper Blue River Group. The upper level lies above a prominent shale 50 ft above the lower level which is in the Ste. Genevieve Limestone below the Lost River chert bed. Large rooms extend upward into the base of the Paoli, where passages collapsed; floors of passages are covered with clay. Disconnected remnants of the upper level passages were fed by vertical tributaries; this passage drained southward at the level of the Blue River strath during late Tertiary. The lower level lies at grade with a minor strath level of early Pleistocene age. There are indications that a large filled passage of early to middle Pleistocene age lies at grade with the deep channel of Blue River.—*from* Author's abstract

Powell, Richard L. *See* Murdock, Stanley H. 06912

00818 **Prokopovich, Nikola P.; MacDonald, Robert B.** Quality of density sampling in unconsolidated alluvium [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 55, 1969.

Prostka, Harold J. *See* Peterman, Zell E. 00821

00853 **Pulpan, Hans.** Stress distribution around certain underground inhomogeneites [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 29, no. 7, p. 2463B, 1969.

07090 **Quigley, R. M.; Tutt, D. B.** Stability—Lake Erie north shore bluffs, *in* Conf. on Great Lakes research, 11th, Milwaukee, Wis., 1968, Proc.: Ann Arbor, Mich., Internat. Assoc. Great Lakes Research, p. 230–238, illus., table, 1968.

The 145-ft high bluffs along the north shore of Lake Erie [Port Bruce, Ontario] are retreating about 5 feet per year through a combination of large circular arc toe failures and toe erosion by wave action. Drained direct shear tests run on the clayey silt till, which comprises the bulk of the slopes, yielded peak cohesion intercepts of 280 to 700 pounds/sq ft and peak friction angles of 26 to 28 degrees. A much reduced residual cohesion intercept of 100 pounds/sq ft was obtained on all samples whereas the residual friction angles were about the same as the peak values. Stability calculations, assuming a horizontal flow pattern, and field observations showed that toe circles are more critical than deeper failures, however, the latter in certain situations could also fail.—Authors' abstract

Quinlivan, W. D. *See* Byers, F. M., Jr. 06816

Quinlivan, W. D. *See* Carr, W. J. 06817

00842 **Radbruch, Dorothy H.** Areal and engineering geology of the Oakland East quadrangle, California: U.S. Geol. Survey Geol. Quad. Map GQ–769, scale 1:24,000, sections, separate text, 1969.

The text contains a table showing for each map unit: general lithologic description, topographic form, weathering and soil development, workability, slope stability and foundation conditions, dry density moisture content and Unified Soil Classification, and remarks (includes use and earthquake stability). The rocks of most of the units have been cut by numerous faults; fractured rocks may form passages for ground water, cuts made across them may require draining, and soft sheared rocks are subject to landsliding. The entire length of the Hayward fault zone is assumed to be active; slow tectonic movement is causing damage to manmade structures which cross the line of creep. Structures within or across the fault zone may be damaged by sudden movement or offset during an earthquake, and be subject to constant strain and damage due to slow movement of sides in opposite directions.—MCM

00819 **Ragan, Donal M.; Sheridan, Michael F.** Foliation in welded tuffs by compaction [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 55–56, 1969.

07069 **Ragland, Paul C.; Rogers, John J. W.; Justus, Philip S.** Origin and differentiation of Triassic dolerite magmas, North Carolina, U. S. A.: Contr. Mineralogy and Petrology, v. 20, no. 1, p. 57–80, illus., tables, 1968.

Ten dikes in Triassic fault troughs of the North Carolina Piedmont have been analyzed for major elements and selected trace elements. One large dike exhibits Palisades-type differentiation by crystal settling of olivine, and another comparatively thick dike shows development of micropegmatite toward the center; the smaller dikes are homogeneous across their width. Most of the dikes crystallized under decreasing oxygen pressure. The North Carolina dolerites are far more similar to oceanic or ocean margin tholeiites than to continental tholeiites, and are distinctly different from plateau basalts but are similar to the chill zones of the Bushveld and Stillwater lopoliths. The low Th, U, and Sr plus a high K/Rb ratio suggest an oceanic evolution for the rocks and that a continental crust and mantle did not exist here in the Triassic.—*from* Authors' abstract

00820 **Rai, Vijai N.** Geology of a portion of the Nightingale and Truckee Ranges, Washoe and Pershing Counties, Nevada [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 56, 1969.

Raitt, R. W. *See* Morris, G. B. 00897

00734 **Raleigh, C. B.; Kirby, S. H.; Carter, N. L.; Ave'Lallemant, H.** Enstatite-clinoenstatite inversion in determination of geologic strain rates [abs.]: EOS (Am. Geophys. Union Trans.), v. 50, no. 4, p. 323, 1969.

00866 **Randazzo, Anthony F.** Petrography and stratigraphy of the Carolina Slate Belt, Union County, North Carolina [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 29, no. 7, p. 2496B, 1969.

Randle, K. *See* Goles, G. G. 00683

00740 **Rankin, D. W.; Stern, T. W.; Reed, J. C., Jr.; Newell, M. F.** Zircon ages of upper Precambrian volcanic rocks of the Blue Ridge, central and southern Appalachians [abs.]: EOS (Am. Geophys. Union Trans.), v. 50, no. 4, p. 330, 1969.

Rasmussen, Donald L. *See* Fields, Robert W. 00681

07033 **Rawson, Jack.** Field monitoring of the quality of water during the drilling of wells, *in* Selected techniques in water resources investigations, 1966–67: U.S. Geol. Survey Water-Supply Paper 1892, p. 60–66, illus., tables, 1968.

During the drilling of wells, aquifers at different depths that yield water of different chemical composition may be penetrated. Although fluid-conductivity logging of the wells provides an indication of the dissolved-solids content of the water in the several aquifers, conductivity alone does not indicate the types and concentrations of individual ions in the water. In conjunction with conductivity measurements, simple, rapid, and accurate visual methods of analysis for chloride, sulfate, and

hardness can be conducted in the field to provide more detailed and reliable information on the chemical composition of the water as it is reached.—Author's abstract

06973 **Rawson, Richard R.** The "Kibbey Limestone" of the Williston basin and central Montana: Earth Sci. Bull., v. 1, no. 3, p. 35–47, illus., table, 1968.

The middle limestone member of the Mississippian Kibbey Formation in central Montana and the Williston basin [North Dakota] was analyzed to determine the facies relations and depositional patterns of carbonates deposited in an ancient epeiric sea. The name Ray Member is given to this unit, which averages 30 feet in thickness and covers an area of approximately 60,000 sq mi. Six limestone textures were recognized: oolitic, pelletal, detrital, sketal, clean micrite, and impure micrite. Their mapping led to recognition of four general sedimentary environments: basin, bank margin, bank and lagoon; each characterized by a particular textural suite. Deposition of the Ray Member began with a rapid transgression of a shallow sea into the Williston basin from the north or northwest, and was brought to a close by a lowering of sea level and deposition of anhydrites in the center of the basin.—*from* Author's abstract

06953 **Rea, W. J.** Geology of the southern part of Montserrat, West Indies [abs.]: Geol. Soc. London Proc. 1968, no. 1649, p. 115–116, 1968.

Reed, J. C., Jr. *See* Rankin, D. W. 00740

07029 **Reed, M. G.** Retention of crude oil bases by clay-containing sandstone [with French, German, and Russian abs.]: Clays and Clay Minerals, v. 16, no. 2, p. 173–178, illus., tables, 1968.

Retention of basic components of a crude oil by clay-containing reservoir sandstone was studied by flowing crude oil through cores and monitoring the concentration of bases in the effluent. Cores that were H-saturated, H-saturated then aged, and Na-saturated retained 0.82, 0.70, and 0.20 meq base/100 g, respectively. Barium exchange capacity values were 0.86, 0.71, and 0.83 meq/100 g. Subsequent floods with water, toluene, and chloroform-acetone removed oil that had increasing concentrations of base and N, indicating that the basic fraction of crude oil was the most difficult fraction to extract from clay mineral surfaces. Retained bases were nitrogenous and the most tenaciously held bases had base/N ratios approaching unity.—Author's abstract

07071 **Reed, P. C.; Scott, J. C.; Golden, H. G.; Avrett, J. R.** Water availability, Conecuh County, Alabama: Alabama Geol. Survey Map 75, scale about 1 in. to 2 mi., section, separate text, 1968.

The principal aquifers underlying Conecuh County are the major northern aquifer (sand and limestone in the Nanafalia and Naheola(?) Formations) and the major southern aquifer (sands in the Moodys Branch, Lisbon, and Tallahatta Formations); they are potential sources of 1 mgd or more to individual wells. Minor aquifers may yield from 0.5 to 1 mgd locally. Water of good chemical quality is available in all aquifers; salty water occurs at considerable depths. Tabular data in the text consists of: geologic units and their water-bearing characteristics, records of wells and springs, chemical analyses of water from wells and springs, and streamflow and chemical quality data.—MCM

07050 **Reed, Philip C.** Geologic map of Conecuh County, Alabama: Alabama Geol. Survey Map 65, scale about 1 in. to 2 mi., text, 1968.

Outcropping geologic units in Conecuh County range in age from Eocene to Holocene, are of sedimentary origin, and consist mainly of sand, sandstone, silt, clay, and limestone. The Eocene series which includes, from oldest to youngest, the Wilcox, Claiborne, and Jackson Groups, is overlain by the Oligocene Series, undifferentiated. Pliocene-Miocene Series undifferentiated overlies the Oligocene in southern parts of the county. Pleistocene and Holocene deposits, present in larger stream valleys, are from 5–30 feet thick. All units are potential sources of ground water for domestic use; industrial and municipal supplies can be obtained from

several aquifers. Sand and gravel, limestone, clay, and brown iron ore are of economic interest.—MCM

00783 **Reed, Walter E.; Gilbert, C. M.** Organic geochemistry of some Late Pleistocene sediments, Mono Basin, California [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 56–57, 1969.

06990 **Reesman, R. H.** Strontium isotopic composition of gangue minerals from hydrothermal vein deposits: Econ. Geology, v. 63, no. 7, p. 731–736, tables, 1968.

Strontium isotopic analyses have been made on strontium-rich, rubidium-poor gangue minerals from several vein-type hydrothermal deposits. These minerals were from deposits in which: (1) Tertiary mineralization occurs within rocks of Tertiary age, (2) Tertiary mineralization occurs within rocks of Precambrian age, and (3) the mineralization is Precambrian. The results of these analyses show that the strontium was derived, at least to a very large extent, from the rocks of the host environment.—Author's abstract

06883 **Reeves, R. G.** Remote sensing and economic geology (with emphasis on open pit deposits) [abs.]: Mining Eng., v. 20, no. 8, p. 27–28, 1968.

06887 **Reichert, S. O.** Geology plays an important role in radioactive waste management: Mining Eng., v. 20, no. 9, p. 98–103, illus., 1968.

Radioactive waste materials from the Savannah River Plant of the AEC must be disposed of with great care to avoid environmental pollution. Geologic and hydrologic parameters, including soil permeability, soil ion-exchange capacity, depth of the water table, and the rate and distance of subsurface water movement, have an important bearing on the selection of disposal sites.—MAC

00907 **Reimnitz, Erk.** Rapid changes in head of Rio Balsas submarine canyon [abs.]: Am. Assoc. Petroleum Geologists Bull., v. 53, no. 2, p. 459–460, 1969.

07047 **Retcofsky, H. L.; Friedel, R. A.** Spectral studies of a carbon disulphide extract of bituminous coal: Fuel, v. 47, no. 6, p. 487–498, illus., tables, 1968.

The structure of the carbon disulfide extract of vitrain-rich Pittsburgh coal was studied by various spectral techniques. The carbon disulfide-soluble material was obtained by extracting the coal with pyridine followed by extraction of the pyridine-soluble material with carbon disulfide. Both the pyridine and carbon disulfide extracts were studied by ultra-violet-visible and infra-red spectrophotometry and by electron and magnetic resonance.—*from* Authors' abstract

00830 **Rice, H. M. A.** An antlion (Neuroptera) and a stonefly (Plecoptera) of Cretaceous age from Labrador, Newfoundland: Canada Geol. Survey Paper 68-65, 11 p., illus., 1969.

A distinctive bed of fine-grained red argillite discovered during development of the Redmond iron deposit, Knob Lake district, Labrador, yielded 37 species of plants which were identified by Dorf (1959) and interpreted by him as early Late Cretaceous in age and suggestive of a warm, humid climate. Two fossil insects, also found in the argillite, are here described. *Palaeoleon ferrogeneticus* n. gen. n. sp. is most of one wing, with venation beautifully preserved, of a large, strong-flying neuropteran probably of a family close to or ancestral to the Myrmaleontidae. *Palaeopteron complexus* n. gen. n. sp. consists of all four wings compressed together, poorly preserved head and pronotum, of a robust plecopteran of the family Pteronarcidae.—VMJ

00867 **Rich, Ernest I.** Geology of the Wilbur Springs quadrangle, Colusa and Lake Counties, California [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 29, no. 7, p. 2496B–2497B, 1969.

Richards, Michael L. *See* Banks, Norman G. 00754

Richards, Paul G. *See* Teng, Ta-Liang. 00927

06853 **Ridge, J. D.** Distinguishing the epigenetic from the syngenetic ore deposits [abs.]: Mining Eng., v. 20, no. 12, p. 67, 1968.

Riley, J. M. *See* Rosenbaum, J. B. 06855

06937 **Riva, John.** Graptolite faunas from the Middle Ordovician of the Gaspé north shore [with French abs.], *in* Éditions spéciales du centenaire, 1868–1968—Sciences de la terre: Naturaliste Canadien, v. 95, no. 6, p. 1379–1400, illus., 1968.

Graptolite faunas suggest that at least two major sequences are present: one comprising strata of Normanskill "Magog" and lower Utica age and one consisting of a flysch of Canajoharie and lower Utica age. Six graptolite faunas, capable of zonal distinction, are recognized in the Middle Ordovician of northeastern North America. Normanskill graptolites are referred to only one zone, that of *Nemagraptus gracilis*; this is followed by the "Magog fauna", still in process of definition and evaluation, and by two Canajoharie and two Utica zones. The writer finds it impossible to interpret "Magog", Canajoharie and Utica faunas in terms of the zone of *Orthograptus truncatus* var. *intermedius* (zone 13) of the Ordovician sequences of Texas (Berry, 1960).—*from* Author's abstract

Roberts, Bill. *See* Kernaghan, James S. 06891

06893 **Roberts, W. L.; Cope, Joseph H.** Utilization of mine dumps in the Black Hills, South Dakota, Ingersoll and Tin Mountain mines: South Dakota Acad. Sci. Proc. 1968, v. 47, p. 75–85, illus., tables, 1968.

Five previously unreported minerals were identified in 61 samples from the Ingersoll pegmatite mine dumps and five from 31 samples from the Tin Mtn. dumps. X-ray spectroscopy of 91 samples from the two mines disclosed a similarity for all elements, with the exception of a higher concentration of rubidium and cesium in samples from the Tin Mtn. mine. Methods for recovery of microlites from selected ore from the Tin Mtn. dumps were investigated, and flotation combined with preliminary electrostatic separation of feldspar and quartz is the most practical method. A hand-sorting of samples from the Ingersoll mine indicates that 17.92 percent of the dumps can be recovered by the above method. Economic minerals that can be recovered are: quartz, feldspars, scrap mica, lepidolite, amblygonite, beryl, spodumene, and cassiterite.—*from* Authors' abstract

00744 **Robertson, Eugene C.; Peck, Dallas L.** Thermal conductivity of vesicular basalt [abs.]: EOS (Am. Geophys. Union Trans.), v. 50, no. 4, p. 339, 1969.

Robinson, E. S. *See* Mabey, D. R. 06848

Robinson, G. D. *See* Carpenter, R. H. 06834

00724 **Roddy, D. J.; Jones, G. H. S.; Diehl, C. H. H.** Similarities of 100 and 500 ton TNT explosion craters and proposed comet impact craters [abs.]: EOS (Am. Geophys. Union Trans.), v. 50, no. 4, p. 220, 1969.

00725 **Roddy, D. J.; Davis, L. K.** Shatter cones at TNT explosion craters [abs.]: EOS (Am. Geophys. Union Trans.), v. 50, no. 4, p. 220, 1969.

06943 **Roedder, Edwin; Skinner, Brian J.** Experimental evidence that fluid inclusions do not leak: Econ. Geology, v. 63, no. 7, p. 715–730, illus., tables, 1968.

New experiments were performed on small quartz crystals and cleavage fragments of sphalerite and calcite, none requiring sawing, grinding or polishing. Quartz samples were run at external water pressures of 2000 and 4000 bars, and temperatures from 100° to 400°C for up to 17 days. Internal pressures exceeded external by 2000–3000 bars in some runs. "From this work and a review of the literature [authors] conclude that most inclusions have not suffered major leakage. Some previous experiments indicating leakage may be explained by microfractures

introduced during sample preparation." Leakage, by diffusion, of substances like hydrogen is not precluded.—WSW

06977 **Roedder, Edwin.** Fluid inclusion researh—Proceedings of COFFI: Econ. Geology, v. 63, no. 7, p. 835, 1968.

Proceedings of the Commission on Ore-Forming Fluids in Inclusions will include abstracts in English and French of articles describing work on inclusions.—WSW

Rogers, C. L. *See* Ekren, E. B. 06795

Rogers, John J. W. *See* Ragland, Paul C. 07069

07028 **Rollins, M. B.; Pool, D. L.** Measurement of exchangeable cations in bentonites [with French, German, and Russian abs.]: Clays and Clay Minerals, v. 16, no. 2, p. 165–172, tables, 1968.

High-swelling bentonites cannot be analyzed for exchangeable cations with exactly the same techniques used for most soils. In particular, smaller samples of 0.5 g must be used to insure extraction of cations, and a higher centrifugal force must be used to avoid sample losses. The modified method proposed here requires little time, but still compares closely with results obtained by Frink's more extensive method. Results obtained for fourteen western bentonites show good agreement between total exchangeable cations and CEC. Chemical properties for the bentonites were found to change both with geographical location and with location within each deposit.—*from* Authors' abstract

00978 **Rona, E.; Brandau, B. L.** Absolute dating of ocean sediments by use of Th-230/Pa-231 ratio: Bull. Volcanol., v. 32, no. 3, p. 509–514, illus., tables, 1969.

The absolute dating method based on the activity ratio Th-230/Pa-231 extends to about 200,000 years. It is based on the fact that while uranium is soluble in sea water, Th-230 and Pa-231, daughters of U-234 and U-235, are not. If certain conditions are met, the age of a sample can be calculated from a formula which takes into account the presence of some uranium-supported Th-230 and Pa-231. The experimental method is described, and results obtained on two Caribbean cores are tabulated.—DBV

06854 **Rose, A. W.** Origin of local and temporal heavy metal variations in stream sediments [abs.]: Mining Eng., v. 20, no. 12, p. 47, 1968.

06855 **Rosenbaum, J. B.; May, J. T.; Riley, J. M.** Gold in sea water—Fact or fancy [abs.]: Mining Eng., v. 20, no. 12, p. 49–50, 1968.

07093 **Ross, Curtis; Potos, Chris.** The quantitative determination of ferrous iron in lake sediments, *in* Conf. on Great Lakes research, 11th, Milwaukee, Wis., 1968, Proc.: Ann Arbor, Mich., Internat. Assoc. Great Lakes Research, p. 585–587, 1968.

The test for ferrous iron employs an oxidation-reduction procedure in which potassium dichromate is used as the standard oxidizing solution and diphenylamine sulfonate as the indicator. Caution must be exercised in all instances to exclude an oxidizing atmosphere above the test specimen. Phosphoric acid is added early in the procedure to complex any initial ferric iron in the specimen and also to complex the ferric iron formed upon oxidation by titration with dichromate. Excellent recoveries with a high precision have been obtained. [This test was devised to determine the relation of the ferrous iron in the sediments of Lake Erie to the seasonal oxygen depletion in the hypolimnion during thermal stratification periods.]—Authors' abstract

00811 **Ross, John V.; Christie, James C.** Polyphase deformation within the Shuswap terrane of the southern Okanagen Valley, British Columbia, Canada [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 57–58, 1969.

07005 **Rouse, Roland C.; Peacor, Donald R.** The relationship between senaite, magnetoplumbite, and davidite: Am. Mineralogist, v. 53, nos. 5–6, p. 869–879, illus., tables, 1968.

Senaite has space group R3 or $R\bar{3}$ with a = 10.42 A and c = 20.86 A. Analysis of the implication function I_3 (xyO) together with chemical analyses shows that it has the probable formula $Pb(Ti,Fe,Mn,Mg)_{24}O_{38}$ with Z = 3 for the hexagonal cell. The structure is based on oxygen closest-packing with, by analogy to the magnetoplumbite structure, Pb in the anion framework. Davidite, which has a unit cell of the same dimensions as that of senaite, has the probable primitive unit cell contents $(Ti,Fe,...)_{21}O_{39}$.—Authors' abstract

Rowland, L. O. *See* Fiskell, J. G. A. 06950

00868 **Roy, Kenneth James.** Stratigraphic analysis and environmental reconstruction of the Boundary Member of the Charlie Lake Formation (Triassic), northeastern British Columbia, Canada [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 29, no. 7, p. 2497B, 1969.

06986 **Roy, Supriya.** Mineralogy of the different genetic types of manganese deposits: Econ. Geology, v. 63, no. 7, p. 760–786, illus., tables, 1968.

In hydrothermal deposits (vein deposits and thermal-spring aprons) manganese minerals are zoned, from reduced species in depth to more oxidized species, mainly oxides, near surface. In unmetamorphosed sedimentary deposits carbonates or higher oxides predominate; mineralogy is controlled by physico-chemical conditions of deposition or diagenesis. Metamorphosed sedimentary deposits contain a large variety of manganese minerals, those present in a given deposit being dependent on the original sediment and the grade of metamorphism. The superficial deposits generally consist of the higher oxides. The mineralogy of individual deposits of these various types throughout the world is presented in a series of tables.—WSW

Rubin, Meyer. *See* Marsters, Beverly. 00838

00812 **Runnells, Donald D.** Mixing of natural waters and diagenesis [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 58, 1969.

Ruotsala, A. P. *See* Taylor, G. L. 06960

06961 **Ruotsala, Albert P.** Clay alteration associated with mineralization in the Michigan copper district: Clays and Clay Minerals, v. 16, no. 5, p. 400–402, illus., 1968.

Native copper is the dominant ore in the Keweenaw district, and mineralization is found chiefly in amygdaloidal basalts and interstratified conglomerates. The deposits are thought to be low- to intermediate-temperature hydrothermal types. Chlorite is the most extensive alteration product, found as crystallized vesicle fillings as well as massive alteration products. Three important occurrences of clays are described: surrounded by spherical sheaths of copper, "skulls", in the Centennial No. 3 mine; hanging wall "slip", fault gouge, in the Kingston mine; and fault gouge in the Allouez Gap fault.—ESL

06957 **Rüter, H.** Berechnung der Richtungsabhangigkeit der P-Wellen-Geschwindigkeit in polykristallinen Eisproben mit vorgegebener C-Achsen-Verteilung aus den elastischen Konstanten des Einkristalls [with English abs.]: Polarforschung 1967, v. 6, pt. 37, nos. 1–2, p. 175–177, illus., 1968.

A method is presented to calculate with approximation the P-wave-velocities in polycrystalline aggregates with a nonstatistic distribution of c-axes. This is achieved by calculating the mean value of reciprocal velocities. The obtained results are plotted for a sample from Tuto-Icetunnel (Greenland) and Emmons-Glacier [Washington] (USA).—Author's abstract

06884 **Rychkun, Edward A.; Cannon, Richard W.** Derivative analysis and the use of the computer in studying geological and geophysical data [abs.]: Mining Eng., v. 20, no. 8, p. 22, 1968.

06924 **Sabourin, Robert.** L'abbé J.-W. Laverdière, 1897–1967, *in* Éditions spéciales du centenaire, 1868–1968—Sciences de la terre: Naturaliste Canadien, v. 95, no. 6, p. 1186–1188, portrait, 1968.

00869 **Sahni, Ashok.** The vertebrate fauna of the Judith River Formation, Montana [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 29, no. 7, p. 2497B–2498B, 1969.

06934 **Saint-Julien, Pierre.** Les "argiles-à-blocs" du sud-ouest des Appalaches du Québec [with English abs.], *in* Éditions spéciales du centenaire, 1868–1968—Sciences de la terre: Naturaliste Canadien, v. 95, no. 6, p. 1345–1356, illus., 1968.

Three bands of "shale with blocks" enclosed (wildflysch) occur in the Ordovician of southwestern Quebec. Huge blocks occur in a groundmass of pelite. Two bands occur around a klippe of the Sillery Group and seem to be related to the emplacement of the latter. The third band occurs about 25 miles to the southeast of the klippe between the Caldwell Group and the Magog Group. No provenance for these rocks is known. They may be the lower part of an allochthonous series, and if so, the Caldwell, Rosaire, and Armagh Groups and the Sutton–Bennett schists and the ophiolitic sequence represent an overthrust nappe.—*from* Author's abstract

06856 **Salotti, C. A.** The metamorphic origin of the present Ducktown, Tennessee ore deposits [abs.]: Mining Eng., v. 20, no. 12, p. 67, 1968.

06955 **Sandner, Werner.** Meteoritenkrater in den Polargebieten [Conclusion]: Polarforschung 1967, v. 6, pt. 37, nos. 1–2, p. 178–180, table, 1968.

Early contributions by this author, on the distribution of meteorite craters in the polar regions of the world, include a brief summary and supplement (ibid., 1962, v. 5, pt. 32, p. 144–146, 1963 and 1963, v. 5, pt. 33, p. 220, 1964). From more recent publications by the Dominion Observatory Ottawa, and others, and by J. H. Freeberg (U.S. Geol. Survey Bull. 1220, 1967), a list of known craters is here presented, giving names and coordinate positions; it includes 18 craters in Canada, and one each in Greenland, the Aleutian Island of Amak, Alaska, the Tungusska field in Siberia, and the Wilkes Land structure in Antarctica. Of these, eleven are arctic and ten subarctic areas. Canadian structures, in very ancient landmasses, even Precambrian, have significance for their age and "fossil" condition. Further detailed study is needed for certainty of their origin.—GDC

Sanford, B. V. *See* Belyea, H. R. 07082

Sargent, K. A. *See* Noble, Donald C. 06808

Sargent, K. A. *See* Orkild, Paul P. 06815

00979 **Sattlegger, J. W.** Three-dimensional seismic depth computation using space-sampled velocity logs: Geophysics, v. 34, no. 1, p. 7–20, illus., 1969.

Approaches for depth computation presuming the velocity to be described by some simple analytic function may no longer be considered adequate. This paper describes three approaches to depth computation, which are applicable in cases of arbitrarily complicated velocity distributions. With these approaches, accuracy may be increased to any desired degree or to any degree which seems reasonable with respect to the velocity information available.—*from* Author's abstract

00813 **Saul, LouElla R.** Evidence for the genesis of the Mactridae in the Cretaceous [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 58–59, 1969.

06931 **Sauvé, Pierre; LaSalle, Pierre.** Notes sur la géologie glaciaire de la région de Manic 2 [with English abs.], *in* Éditions spéciales du centenaire, 1868–1968—Sciences de la terre: Naturaliste Canadien, v. 95, no. 6, p. 1293–1300, illus., 1968.

A large deposit of fluvioglacial material overlies marine clay near the site of the Manic 2 dam in the lower Manicouagan River valley, Saguenay County, Province of Québec. Combined with other features, this indicates that the ice front stayed stationary for some time during deglaciation of the area. Fossils from a clay deposit, which is almost certainly older than the fluvioglacial material, have yielded a ^{14}C age of 9150 ±150 years B.P.—Authors' abstract

Savage, D. E. *See* Waters, Barbara K. 00802

07027 **Sawhney, B. L.** Aluminum interlayers in layer silicates—Effect of OH/Al ratio of Al solution, time of reaction, and type of structure [with French, German, and Russian abs.]: Clays and Clay Minerals, v. 16, no. 2, p. 157–163, illus., tables, 1968.

Aluminum interlayers were synthesized in a number of vermiculites and montmorillonites. Vermiculite fixed Al as well as OH/Al in its interlayers, producing a stable 14A spacing and decreasing its cation exchange capacity. Some interlayers collapsed on heating to 300°C, and others did not. Neither aging of vermiculite in Al solutions or their OH/Al ratios changed stability of the interlayers. Montmorillonite did not fix Al ions but did fix appreciable amounts of hydroxy-Al ions. In addition, stability of interlayers increased on aging in OH/Al solutions. It is postulated that the more expanded interlayer space in montmorillonite provide a favorable locale for organization of OH/Al ions into gibbsite structure whereas the restricted expansion in vermiculite prevents it.—*from* Author's abstract

Schiller, E. A. *See* Hodder, R. W. 06873

Schlanger, Seymour O. *See* Weir, Gordon W. 00843

Schmidt, A. W. *See* Bond, L. O. 06829

06914 **Schneider, Allan F.** The Tinley Moraine in Indiana: Indiana Acad. Sci. Proc. 1967, v. 77, p. 271–278, illus., 1968.

The Tinley Moraine, named in Illinois for a subsidiary ridge inside the Valparaiso Morainic System, has had little recognition as a discrete moraine in Indiana. It is suggested that the Lake Michigan Lobe probably receded and then readvanced to form the Tinley Moraine, whose main ridge can be traced for about 20 mi across Lake and western Porter Counties. It is recognized most easily by ice-block depressions and drainage relations along its distal margin. Beyond the eastern end of the segment, the moraine becomes obscure. The ice apparently curved northward and is represented by an upland till plain, prbably deposited in a lake. Further northeast, the terminal zone is possibly marked by an undulating till belt, which has been considered part of the Lake Border Morainic System which dates from the Glenwood stage, whereas the Tinley is considered pre-Glenwood.—*from* Author's abstract

06897 **Schoen, R.; Ehrlich, Garry G.** Bacterial origin of sulfuric acid in sulfurous hot springs, *in* Internat. Geol. Cong., 23d, Prague, 1968, Proc., Symposium 2, Genesis of mineral and thermal waters: Prague, Academia, p. 171–178, illus., table, 1968.

The sulfur-oxidizing bacterium *Thiobacillus thiooxidans* has been found in abundance in many sulfurous hot-spring areas in the western United States. The bacterium occurs only in samples taken from depths less than 18 cm and at temperatures less than 50°C. Hot-spring areas in which H_2S, CO_2 and H_2O are constantly supplied from depth and the ground temperature is uniformly warm throughout the year, are ideal places for the growth of the bacterium. The quantity of sulfuric acid that the bacterium can produce in its life processes appears to be adequate to account for the sulfuric acid observed in most acid thermal springs. Although an inorganic mechanism may exist for the natural oxidation of H_2S and elemental S to sulfuric acid, its rate is probably so much slower than exhibited by *T. thiooxidans* as to be quantitatively insignificant.—Authors' abstract

00906 **Scholl, David W.; Greene, H. Gary; Addicott, Warren O.; Evitt, William R.; Pierce, Richard L.; Mamay, Sergius H.; Marlow, Michael S.** Adak "Paleozoic"

site, Aleutians—In fact of Eocene age [abs.]: Am. Assoc. Petroleum Geologists Bull., v. 53, no. 2, p. 459, 1969.

00870 **Schroeder, Johannes Herbert.** Experimental dissolution of calcium, magnesium, and strontium from recent biogenic carbonates—A model of diagenesis [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 29, no. 7, p. 2498B, 1969.

00844 **Schroeder, Marvin L.** Geologic map of the Teton Pass quadrangle, Teton County, Wyoming: U.S. Geol. Survey Geol. Quad. Map GQ-793, scale 1:24,000, sections, text, 1969.

Resources of economic interest in the Teton Pass quadrangle are: phosphate, mainly in the Meade Peak Phosphatic Shale Member of the Phosphoria Formation, but not mined because of thicker, higher grade, and more readily accessible deposits in other areas; sand and gravel in terrace deposits and alluvium; limestone; riprap, available from several formation; and water from streams. Although no drilling has been done for oil and gas, the area is considered of exploratory interest because of the thick sedimentary sequence.—MCM

06968 **Schuberth, Christopher J.** The geology of New York City and environs—An illustrated guide to the geologic evolution of the metropolitan area, including eight detailed itineraries of regional field trips: Garden City, N.Y., Nat. History Press, 304 p., illus., 1968.

Geologic evolution of the New York metropolitan area and surrounding region is recounted from Precambrian time to the present, with emphasis on paleogeography and landform evolution. An introductory chapter outlines the rock types and physiographic provinces of the region. Subjects of succeeding chapters are: changing landscapes of the Paleozoic Era, including evolution of the Appalachian geosyncline and several orogenies; Precambrian and Paleozoic rocks of the City and environs; landscapes of the Mesozoic; Tertiary and Quaternary events shaping the modern landscape, including glaciation and shoreline evolution. Eight itineraries for field trips, each requiring a full day, supplement the text. An 8-page bibliography is included.—VMJ

Scott, J. C. *See* Turner, J. D. 06966

Scott, J. C. *See* Shamburger, V. M., Jr. 07070

Scott, J. C. *See* Reed, P. C. 07071

Scott, J. C. *See* Newton, J. G. 07073

Scott, J. C. *See* McWilliams, R. G. 07074

06857 **Scott, James J.** Effects of shale on roof stability in underground mining [abs.]: Mining Eng., v. 20, no. 12, p. 51, 1968.

00939 **Scott, W. J.; West, G. F.** Induced polarization of synthetic high-resistivity rocks containing disseminated sulfides: Geophysics, v. 34, no. 1, p. 87-100, illus., tables, 1969.

The induced polarization and resistivity of a suite of 74 synthetic, low porosity, "rock" specimens were measured by the pulse transient method. The specimens contained up to 8 percent by volume of sulfide particles in three different grain sizes. Chargeability was found to vary from 1 to 30 ms. For current density less than about 0.1 μa per sq cm, it was independent of charge current density, but decreased about 20 percent per decade with increase in current density. A background chargeability of a few msec was found in nonmineralized specimens and assumed to be present in all. Chargeability due to metallic minerals was found to be proportional to sulfide content and to decrease with increasing grain diameter. The observed decay forms were approximately logarithmic.—*from* Authors' abstract

06925 **Seguin, Maurice.** The Fe–C–O–S + (H_2O) system—Pt. 1, Experimental results [with French abs.], *in* Éditions spéciales du centenaire, 1868–1968—Sciences de la terre: Naturaliste Canadien, v. 95, no. 6, p. 1195–1215, illus., tables, 1968.

The system Fe–C–O–S was studied in detail within the temperature and pressure range of 75°–800°C and approximately 1–2900 bars, respectively. The system was studied in both dry and hydrous conditions. Important experimental results at a pressure of 2000 bars in anhydrous conditions are [shown in a table]. The addition of H_2O to the Fe–C–O–S system generally lowered the stability of the assemblages by some 15°–20°C. The main effect of H_2O consists in breaking down the grain size to an ionic dimension and activating the reaction, i.e. speeding the attainment of equilibrium.—*from* Author's abstract

06926 **Seguin, Maurice.** The Fe–C–O–S + (H_2O) system—Pt. 2, Applications to iron formations in the Michipicoten and Central Labrador areas [with French abs.], *in* Éditions spéciales du centenaire, 1868–1968—Sciences de la terre: Naturaliste Canadien, v. 95, no. 6, p. 1217–1230, 1968.

Temperatures are approximated for the ores of the Labrador Trough and the Michipicoten district based upon hematite–magnetite and fayalite–magnetite–silica assemblages. That of the Schefferville area in the Labrador Trough was below 360°C, generally around 290°, and occasionally lower. The degree of metamorphism of the Michipicoten iron formation, Ontario, is slightly higher than in Labrador (near or slightly higher than 290°C in the south, and around 360°C, possibly as high as 400°C but less than 460°C in the north); the folding and regional metamorphism was prehydrothermal. The Keewatin ores are definitely sedimentary in origin, but the Michipicoten ores had a sedimentary primary origin, later supplemented by hydrothermal mineralization at a temperature between 180° and 350°C.—*from* Author's abstract

Senftle, F. E. *See* Gilchrist, J. 00934

06987 **SenGupta, J. G.** Abundances of the six platinum metals in some iron and stony meteorites—Relationships to the theories of evolution of parent bodies of meteorites and the origin of these elements: Chem. Geology, v. 3, no. 4, p. 293–305, illus., tables, 1968.

Abundances of the six platinum metals in five stony and three iron meteorites have been determined. Average atomic abundances of the six (relative to 10^6 silicon atoms) in one enstatite and four ordinary chondrites lie in the range 0.45–1.47, close to those calculated from theories of nucleosynthesis and to neutron activation and spectrographic analyses. Platinum metals are 5–100 times more abundant in iron than in stony meteorites. Fractionation of metals in parent bodies of meteorites, Earth, and Sun, and reasons for depletion of Os and Ru in these bodies relative to Pt and Pd are discussed. A positive correlation has been found between platinum metal content and nickel content. An analytical verification of the theory of Burbidge et al (1957) regarding origin of various nuclides of platinum metals is offered.—*from* Author's abstract

00949 **Seyfert, Carl K.** Undeformed sediments in oceanic trenches with sea floor spreading: Nature, v. 222, no. 5188, p. 70, illus., 1969.

Seismic reflection profiling of the Peru–Chile trench has shown a very sharp contact between undeformed sediments within the trench and the higher velocity layer underlying the lower continental slope. If the reason for the absence of large thicknesses of deformed sediment associated with oceanic trenches is that they have been converted into sedimentary and metamorphic rocks as a result of deformation along Benioff zones, the absence of deformed sediments associated with oceanic trenches is not a valid argument against movement of the sea floor under continents and island arcs in the vicinity of thes trenches.—DBV

Shaffer, F. B. *See* Souders, V. L. 07053

07070 **Shamburger, V. M., Jr.; Scott, J. C.; Golden, H. G.; Avrett, J. R.** Water availability, Pike County, Alabama: Alabama Geol. Survey Map 73, scale about 1 in. to 2 mi., section, separate text, 1968.

The two principal aquifers in Pike County are the major shallow aquifer (sand in Ripley Formation) and the major deep aquifer (sand in lower part of Eutaw Formation and in upper part of underlying Tuscaloosa Group); the latter has not been developed, but electric and sample logs of oil-test wells, and water wells in adjacent areas indicate the aquifer is a potential source of large supplies. Chemical quality of both ground and surface water is generally satisfactory, although locally the ground water is hard and contains objectionable amounts of iron. The text contains tabulated data on the geologic units and their water-bearing characteristics, records of wells and springs, chemical analyses of water from wells and springs, chemical analyses of water from streams, and summary of potential water supplies at selected sites.—MCM

Shapiro, J. N. *See* Knopoff, L. 00989

00990 **Shapiro, J. N.; Knopoff, L.** Reduction of shock-wave equations of state to isothermal equations of state: Jour. Geophys. Research, v. 74, no. 6, p. 1435–1438, tables, 1969.

A method is presented whereby shock-wave data can be reduced from the experimentally determined Hugoniot equations of state to isothermal equations of state. The method is similar to that used by Takeuchi and Kanamori (1966) but is mathematically simpler and more readily adapted to numerical computation. Unlike other treatments of shock-wave data, no extrapolations to zero temperature are required.—Authors' abstract

Sharp, John V. A. *See* Essington, Edward H. 06797

00984 **Sharp, W. E.** Melting curves of sphalerite, galena, and pyrrhotite and the decomposition curve of pyrite between 30 and 65 kilobars: Jour. Geophys. Research, v. 74, no. 6, p. 1645–1652, illus., 1969.

The melting slopes of galena and pyrrhotite were determined to be +5 and +6°C per kb, whereas the slope of the decomposition curve of pyrite was found to be +9°C per kb. Zinc sulfide has a negative melting slope of -5°C per kb up to 40 kb, where the slope changes to a positive one of about +3°C per kb. The melting slopes of the metal sulfides indicate that, if silicate magma forms at depths below 80 kb, sulfide magma should also form. Its downward intrusion could help to explain the origin of deep focus earthquakes.—Author's abstract

07019 **Shaw, Frederick C.** Early Middle Ordovician Chazy trilobites of New York: New York State Mus. and Sci. Service Mem. 17, 163 p., illus., tables, 1968.

Trilobites of 49 species (12 new) are described from 58 localities of the Chazy Group (Day Point, Crown Point, and Valcour Formations and members) of the northern Champlain Valley in New York and Vermont; stratigraphy, lithology, and facies are described from measured sections. The major new contribution of this paper was supplied by four large assemblages of silicified specimens; 38 genera and 17 ptychopariid, phacopid, and lichid families are represented; 63 percent of the genera are confined to the Chazy and younger rocks. Trilobite faunas are not distinct for the formations, hence cannot be used as a basis for three stages of a Chazyan Series; the Chazy fauna must be considered in its entirety in regional correlations. Time-rock equivalents, and relations to the Whiterock Stage and the Black River Group, are discussed.—VMJ

Shaw, Herbert R. *See* Gruntfest, Irving J. 00733

07018 **Shawe, Daniel R.; Simmons, George C.; Archbold, Norbert L.** Stratigraphy of Slick Rock district and vicinity, San Miguel and Dolores Counties, Colorado: U.S. Geol. Survey Prof. Paper 576-A, p. A1–A108, illus., tables, geol. maps, 1968.

Deposition of Paleozoic sedimentary rocks in the district and vicinity was controlled principally by the Paradox Basin, and of Mesozoic rocks by a basin farther west. Thickness of sedimentary rocks is about 13,000 feet. Arenaceous strata of early Paleozoic age are overlain by dominantly marine carbonate rocks and evaporite beds interbedded with lesser amounts of clastic sediments of late Paleozoic age (5,000 feet). Above these are terrestrial clastic sediments—sandstone and lesser shale, mudstone, siltstone, and conglomerate—of late Paleozoic and Mesozoic age (4,500 feet). Above these is marine shale of late Mesozoic age (as much as 2,300 feet). Sandstone and shale of late Mesozoic and early Cenozoic age (5,000? feet) overlay the older rocks prior to late Cenozoic erosion. Minor Cenozoic igneous rocks and surficial deposits are present.—DRS

00814 **Sheridan, Michael F.; Stuckless, John S.** Volcanics related to the Black Mesa caldera, central Arizona [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 60–61, table, 1969.

Sheridan, Michael F. *See* Ragan, Donal M. 00819

Shirley, F. R. *See* Fischer, Irene. 07077

00784 **Shlemon, Roy J.; Hansen, Richard O.** Radiometric and faunal dating of Quaternary alluvium in the Sacramento area, California [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 61–62, 1969.

Shor, G. G., Jr. *See* Morris, G. B. 00897

00958 **Silberling, N. J.; Wallace, Robert E.** Stratigraphy of the Star Peak Group (Triassic) and overlying lower Mesozoic rocks, Humboldt Range, Nevada: U.S. Geol. Survey Prof. Paper 592, 50 p., illus., table, 1969.

The Star Peak Group and younger lower Mesozoic rocks of the "Winnemucca sequence" of Silberling and Roberts form half the bedrock exposures in the Humboldt Range of northwestern Nevada. The strata are more than 10,000 feet thick, largely marine sedimentary rocks, and overlie with angular unconformity the Koipato Group of Permian to Triassic age. The lithology, fossils, and paleogeography of the Prida and Natches Pass Formation of the Star Peak Group and of the Grass Valley Formation, and the lithology and fossils of the Dun Glen Formation and Post–Dun Glen lower Mesozoic strata are described in detail.—VSN

00809 **Silberman, M. L.; Wrucke, C. T.; Armbrustmacher, T. J.** Age of mineralization and intrusive relations at Tenabo, northern Shoshone Range, Lander County, Nevada [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 62, table, 1969.

Simkin, Thomas. *See* Duncan, John R. 00723

Simkin, Thomas. *See* Melson, William G. 00746

Simmons, George C. *See* Shawe, Daniel R. 07018

06899 **Skaggs, R. W.; Huggins, L. F.; Monke, E. J.** An aerodynamic method for sizing sands and other granular materials: Indiana Acad. Sci. Proc. 1967, v. 77, p. 377–388, illus., tables, 1968.

A method of separating granular materials according to size by their relative displacements when dropped into a moving air stream is presented. Equations of motion for a spherical particle in a moving air stream were solved using an analog computer. This method allows drag forces in both horizontal and vertical directions to be evaluated. The solution was used to design an apparatus to separate granular materials in the sand size range; tests were conducted to determine trajectories of various particle sizes for a range of air velocities. Results were compared with those predicted by analog solution. Agreement of predicted and observed trajectories and the reliability with which the apparatus will size samples of glass beads and sands are discussed. The apparatus will be useful for sizing large

quantities of granular materials for use in mechanics of erosion, infiltration and overland flow studies.—*from* Authors' abstract

Skinner, Brian J. *See* Roedder, Edwin. 06943

Slemmons, D. B. *See* Carver, G. A. 00698

Slutsky, Mary. *See* Fischer, Irene. 07077

00779 **Smiley, Charles J.** Cretaceous floras of Chandler–Colville region, Alaska—Stratigraphy and preliminary floristics: Am. Assoc. Petroleum Geologists Bull., v. 53, no. 3, p. 482–502, illus., tables, 1969.

Seven sequential floral records (plant megafossil zones) based on general taxonomic categories are distinguished in nonmarine units of the Nanushuk Group (middle Albian to early Cenomanian) and Colville Group (Turonian to Maestrichtian?) of northern Alaska. Abundance and variety of each major plant taxon differ at different stratigraphic levels; a striking change in floristics is noted from bottom to top of local sections. Correlations made with zones of other northern Alaska study areas and comparison with Soviet Arctic and Greenland floral records suggest that such zones may be holarctic in extent; with their superpositional relationships and marine fauna interties they may be reliable references for regional Arctic correlations.—EGS

00785 **Smith, Arthur R.** Metallogenic characteristics of the Plumas Copper Belt [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 62–63, 1969.

Smith, Edgar D. *See* Das, Salil K. 07045

00871 **Smith, James William.** The Saltville fault near Mooresburg, Tennessee [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 29, no. 7, p. 2498B–2499B, 1969.

07065 **Smith, Peter J.** Pre–Gilbertian conceptions of terrestrial magnetism: Tectonophysics, v. 6, no. 6, p. 499–510, 1968.

It is now well known that William Gilbert, in his *De Magnete* of 1600, first suggested that the Earth behaves as a great magnet. In fact, Gilbert's conclusion represented the culmination of many centuries of thought and experimentation on the subject. This essay traces the main steps in the evolutionary process from the idea that magnetic 'virtue' derived from the heavens, through the gradual realization that magnetism is closely associated with the Earth, up to the time of Gilbert's definite statement.—*from* Author's summary

06885 **Smith, W. H.; John, E. C.** Geologic mapping techniques and applications at Kennecott's Utah Copper Division open pit mine at Bingham Canyon, Utah [abs.]: Mining Eng., v. 20, no. 8, p. 28, 1968.

Snead, Robert G. *See* Logan, Brian W. 00763

07008 **Snow, Phillip D.; Thompson, Don S.** Comparisons of hydroxy–apatite saturations and plankton concentrations in Lake Erie, *in* Conf. on Great Lakes research, 11th, Milwaukee, Wis., 1968, Proc.: Ann Arbor, Mich., Internat. Assoc. Great Lakes Research, p. 130–136, illus., 1968.

The saturation of hydroxy–apatite and plankton concentrations in Lake Erie are compared and their interdependences are noted. The eastern and central basin waters appear to be undersaturated with respect to hydroxy–apatite, but the western basin waters are near saturation (late fall) or supersaturated (late summer) with respect to hydroxy–apatite. In late fall, the plankton concentrations are low in the eastern and central basins and are predominantly copepods and cladocerans. The western basin has a much higher plankton concentration and are predominantly blue–green algae. In late summer, a similar pattern predominates, but the concentrations are much higher and plankton types are different. This suggests a relationship between plankton concentrations and the degree of saturation of

hydroxy-apatite, or a close relationship of inorganic phosphate reactions and organic (biological) phosphate reactions.—Authors' abstract

Sohl, Norman F. *See* Minard, James P. 00752

07054 **Solov'yev, S. E.** Sanakh—Kad'yakskoye tsunami 1788 g, *in* Problema tsunami: Moscow, Akad. Nauk SSSR Otdeleniye Nauk o Zemli, Sovet po Seysmologii, p. 232–237, illus., 1968.

A hitherto unknown description has been found of the tsunami of 1788 in the Aleutian Islands, among documents concerning the founding and activity of a Russian–American company that operated there in 1799–1867. Some information on that tsunami has been given in Russian and American catalogs. The focus of the 1788 tsunami was between the focuses of that of April 1, 1946 in the Aleutians and that of March 28, 1964, on the Alaska peninsula, both of which were of similar intensity. Both caused destruction and injury in the Hawaiian Islands, and it is possible that the tsunami of 1788 did likewise. In any case it was one of the most catastrophic tsunami in the world.—DBV

Somayajulu, B. L. K. *See* Goldberg, Edward D. 00760

07086 **Somers, Lee H.** Preliminary report on geological studies in northern Lake Michigan using underwater observation techniques, *in* Conf. on Great Lakes research, 11th, Milwaukee, Wis., 1968, Proc.: Ann Arbor, Mich., Internat. Assoc. Great Lakes Research, p. 239–244, illus., 1968.

University of Michigan research personnel made about 400 man dives in 1966–67 to gather geologic data, primarily on bedrock, at 72 stations. Bedrock was found at only two stations; many other locations proved to be deposits of boulders or sediments. Owing to the great variability of sediment types in a given area, sampling and mapping by conventional surface techniques would have little validity. Submerged trenches and till cliffs probably represent subaerial erosion during lower lake stages; in-place tree stumps were sampled for radiocarbon dating. From the deep-diving submersible STAR II, additional large bedrock exposures were observed. At a depth of 863 feet, abundant organisms were seen disturbing the sediment surface; under such conditions, preservation of varves, if formed, would be extremely unlikely.—VMJ

07091 **Somers, Lee H.; Josephson, Paul D.** Bottom sediments of southwestern Lake Michigan, *in* Conf. on Great Lakes research, 11th, Milwaukee, Wis., 1968, Proc.: Ann Arbor, Mich., Internat. Assoc. Great Lakes Research, p. 245–252, illus., table, 1968.

Quantitative studies were made of 25 surficial sediment samples to determine variation of textural properties with relation to depth, distance from shore, and lake bottom topography. Samples taken by dredge along lines perpendicular to shore, were examined by microscope and analyzed by standard sieve and hydrometer. Size frequency distribution, central tendency, dispersion, skewness, and sand, silt, and clay percentages were calculated. Sediment assemblages are variable; till with gravel veneer is common. Off Chicago, sand bottom alternates with gravel-covered till; median diameter and dispersion of the sand bears little or no relation to water depth or distance from shore. North of Chicago, bottom sands generally become coarser and less well sorted as water depth and distance from short increase.—VMJ

07095 **Somers, Lee H.; Tetzloff, Clifford; Anderson, Robert F.** Operation Submich, *in* Conf. on Great Lakes research, 11th, Milwaukee, Wis., 1968, Proc.: Ann Arbor, Mich., Internat. Assoc. Great Lakes Research, p. 658–663, illus., 1968.

During June 1967, University of Michigan personnel and other observers made 44 dives in Lake Michigan with the STAR II, to determine feasibility of using such submersibles in Great Lakes research, including observations of bedrock and sediments, bottom organisms and plankton. The STAR II is a two-man vehicle 17.7 ft long, weight 4.7 tons, with scientific equipment payload of 250 lbs, operating from a support ship to depths of 1200 ft with submerged endurance of 8 hrs. The

primary technical limiting factor is water transparency; modification of underwater lighting to reduce back-reflection is suggested. The mechanical arm is too limited in movement; rock sampling was difficult. The submersible is not practical in its present form, but advantages and disadvantages are discussed with recommendations for future operations.—VMJ

07006 **Sondaar, P. Y.** The osteology of the manus of fossil and recent Equidae, with special reference to phylogeny and function: Koninkl. Nederlandse Akad. Wetensch. Verh., Afd. Natuurk., v. 25, no. 1, 76 p., illus., tables, 1968.

Type material of 8 genera, from Oligocene *Mesohippus* to living *Equus*, was studied comparatively. In early horses the phalanges in rest position were inclined from ground plane at a much smaller angle and the fetlock joint had less dorsal-ventral flexion than in *Equus*. Three lineages are traced from *Mesohippus*: in *Anchitherium*, the three-toed padded foot is retained; in the *Hipparion* lineage, the central phalanx lengthens and the laterals do not touch the ground; in the *Equus* lineage, the foot becomes monodactyl and the interosseous muscle becomes a tendon to form the automatic springing mechanism. The respective lineages represent browsers, grazers on soft ground, and grazers on open plains. Four species from the middle Pliocene of Chihuahua, Mexico, including a tridactyl, were all grazers but occupied somewhat different habitats because of size difference or specialization.—VNJ

07053 **Souders, V. L.; Shaffer, F. B.** Water resources of Antelope County, Nebraska: U.S. Geol. Survey Hydrol. Inv. Atlas HA-316, 3 sheets, scale 1:125,000, text, sections, 1969.

Sheet 1 contains information on climate, soils, and geology of Antelope County. A generalized section shows thickness, character, distribution, and water supply of stratigraphic units. The Pliocene Ogallala Formation and undifferentiated Pleistocene deposits together form a large fresh-water aquifer. Sheet 2 has maps showing depth to water and configuration of the water table, and estimated transmissibility and thickness of saturated sediments, with a discussion of their relationships. Sheet 3 contains information on surface water and on quality of both surface and ground water; the latter is of the calcium bicarbonate type, is excellent for irrigation, and except for hardness, is suitable for municipal, industrial, domestic and livestock uses.—MCM

00893 **Soutar, Andrew.** Sedimentation in Santa Barbara basin, California [abs.]: Am. Assoc. Petroleum Geologists Bull., v. 53, no. 2, p. 468, 1969.

Spiker, Elliott. *See* Marsters, Beverly. 00838

07056 **Sproule, J. C.; Cleland, N. A.** The present and future of oil and gas in Canada, *in* Dusters and gushers—The Canadian oil and gas industry (J. H. Hilborn and Canadian Petroleum, editors): Toronto, Ontario, Pitt Publishing Co. Ltd., p. 217-226, illus., 1968.

A generalized summary of the petroleum potential of Canada is discussed, with each of the various geological provinces being considered separately. The western sedimentary basin contains 8 billion bbls of oil and 43 TCF of gas in reserve. Seventy-five to 150 billion bbls and 300 to 400 TCF are potential; to date, 3 billion bbls and 8 TCF have been won. The Athabasca tar sands contain 267 billion bbls with no production to date. The Arctic islands sedimentary basin contains no present reserves, and has no production, but there are 50 to 100 billion bbls of oil and 200-300 TCF of gas in ultimate reserve. The west coast offshore basin has no reserves nor production but has 10 billion bbls of oil potential and 60 TCF of gas potential. The east coast offshore basin also has no reserves nor production, but has 10 billion bbls of oil in ultimate reserves, as well as 60 TCF of gas.—HRC

07080 **Sproule, J. C.** Exploration and discovery, *in* Dusters and gushers—The Canadian oil and gas industry (J. H. Hilborn and Canadian Petroleum, editors): Toronto, Ontario, Pitt Publishing Co. Ltd., p. 9-24, illus., tables, 1968.

This is a history of the oil and gas exploration in western Canada. The first well was accidentally discovered in 1883, and the first commercial gas well was drilled

at Medicine Hat in 1901. The first commercial oil well was in the Turner Valley field in 1913. The Norman Wells field, located in 1920, was the first reef reservoir to be recognized. Sporadic discoveries occurred until 1939. The discovery of Leduc in 1947 began an entirely new era which is still in progress. Many of the major discoveries are outlined, although the years 1959–1964 were dry years for the industry. The future for oil and gas exploration is even more promising.—HRC

06945 **Stacey, J. S.; Zartman, R. E.; NKomo, I. T.** A lead isotope study of galenas and selected feldspars from mining districts in Utah: Econ. Geology, v. 63, no. 7, p. 796–814, illus., tables, 1968.

The leads in feldspars from the main Tertiary intrusives in three mining districts are isotopically similar to the lead deposits immediately associated with them. The largest deposits are the least radiogenic in each region, and the maller deposits the more radiogenic. "The ore leads appear to be mixtures in various proportions of lead derived from the intrusive magma [assumed to have evolved along the primary growth curve] and a radiogenic lead component derived from the upper crustal rocks through which the mineralizing fluids passed." One of two alternative models requires only 1,650 m.y. and 2,400 m.y. events in the basement rocks.—WSW

00786 **Stanton, Robert J.; Dodd, J. Robert.** Faunal and geochemical analysis of paleoenvironments, Kettleman Hills, California [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 63, 1969.

00890 **Stapleton, Richard P.** Ultrastructure studies of selected benthic Foraminifera [abs.]: Am. Assoc. Petroleum Geologists Bull., v. 53, no. 2, p. 467, 1969.

Stateham, R. M. *See* Wisecarver, D. W. 06862

00727 **Stead, Frank W.** Geologic considerations [abs.]: EOS (Am. Geophys. Union Trans.), v. 50, no. 4, p. 248, 1969.

06858 **Stefanko, Robert.** Subsurface disposal of mine water [abs.]: Mining Eng., v. 20, no. 12, p. 60–61, 1968.

00886 **Steineck, P. Lewis.** Lineage genera classification of Lower Paleogene planktonic Foraminifera [abs.]: Am. Assoc. Petroleum Geologists Bull., v. 53, no. 2, p. 465, 1969.

00788 **Stensrud, Howard L.; Gresens, Randall L.** Geochemistry of Precambrian muscovite from northern New Mexico [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 64–65, 1969.

Stern, T. W. *See* Rankin, D. W. 00740

Stewart, D. B. *See* Brookins, D. G. 00741

Stieglitz, R. D. *See* Pierce, R. W. 00816

00787 **Stieglitz, Ronald D.** Environments and geologic history of Midle Ordovician through Middle Silurian rocks in the Arrow Canyon Range, Nevada [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 64, 1969.

Stipp, J. J. *See* McDougall, Ian. 00737

07085 **Stoermer, E. F.; Yang, J. J.** A preliminary report of the fossil diatom flora from Lake Huron sediments, *in* Conf. on Great Lakes research, 11th, Milwaukee, Wis., 1968, Proc.: Ann Arbor, Mich., Internat. Assoc. Great Lakes Research, p. 253–267, illus., table, 1968.

A floristic analysis is made of subfossil diatoms from 13 samples, spaced at 15-cm intervals in a 1.8-m core of bottom sedimnts from the deepest part (227 m) of Lake Huron. Of a total of 187 taxa representing 32 genera, 160 are referable to known taxa; some of the others are probably new. For a deep lake basin, an unexpectedly high proportion (average of 35.2 percent) of the taxa are

nonplanktonic. The number of specimens per sample, though variable, tend to decrease with depth in the core. Fluctuations in diversity of flora indicate a major disturbance recorded in the 135-cm sample; shifts in relative abundance of the dominant plankton species indicate a return to relatively lower mineral nutrient levels, a condition correlated with the high water level of the Nipissing Stage of Lake Huron.—VMJ

06985 **Stokes, William Lee.** Relation of fault trends and mineralization, eastern Great Basin, Utah: Econ. Geology, v. 63, no. 7, p. 751–759, illus., tables, 1968.

Computer analysis of fault trends shown on the 1:250,000 geologic maps of western Utah show that trend directions most closely associated with mineralization are N. 60°–65° E., N. 80°–85° E., N. 85°–90° W., and N. 70°–75° E. Faults with northerly, or Great Basin trend, are the most common type, but apparently least favorable for mineralization. "Results are favorable to continued exploration in covered areas along known mineral belts."—WSW

07062 **Stone, D. B.** Geophysics in the Bering Sea and surrounding areas—A review: Tectonophysics, v. 6, no. 6, p. 433–460, illus., 1968.

The deep seismic profile of Shor (1964), and the shallow profiles made by Ewing et al (1965), Scholl et al (1966), and Moore (1964) are the only direct evidence at present of the structure of the oceanic part of the Bering Sea. Indirect evidence in terms of gravity data, magnetic data, and bathymetry add a little but none detailed enough to determine such fundamentals as whether the origin of this part of the sea is basically a continent becoming ocean, or an ocean becoming continent. This review does not draw any real conclusions from the data presented, but merely draws together most of the important results and conclusions of other authors.—*from* Author's summary

00789 **Stout, Martin L.** A comparison of slip-surface geometry in landslides, southern California and Norway [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 65, 1969.

06993 **Straesser, Manfred.** Der Grosse Salzsee Nordamerikas [with English abs.]: Erdkunde, v. 22, no. 4, p. 284–294, illus., 1968.

This Utah remnant of pluvial Lake Bonneville, in the northeastern corner of the Great Basin, is fed by three rivers from the Wasatch Range and Uinta Mts. Its fluctuations in level and area relate to changes in climate, the long-term overlapped by annual fluctuations. The amount of ground water that flows, in two specific years from the Wasatch Range to the lake, varies between 300 million and 1 billion m^3, considering an evaporation of 1077 mm and 1290 mm respectively. The salinity of the lake is about 25 percent; the chief constituent of the salt, 77 percent, is sodium chloride, its origin not definitely known. The chemical composition of the lake brine is similar to that of sea water; sodium chloride has been recovered from it since pioneer days. Sediments of the lake are calcareous clays and silts, oolite sands, algal reefs, and saline precipitates. Two kinds of living algae support brine shrimp and the salt fly.—GDC

Strangway, D. W. *See* Larson, E. E. 00926

06909 **Straw, W. Thomas.** The upper alluvial terrace along the Ohio River Valley in south-central Indiana: Indiana Acad. Sci. Proc. 1967, v. 77, p. 231–235, illus., 1968.

Most pre-Wisconsin sediments in that reach of the Ohio River Valley from Mauckport to Cannelton, Indiana, were removed by erosion prior to invasion of the Valley by outwash of Wisconsin age. Invasion of the Valley by glacial meltwaters and outwash resulted in emplacement of a valley train in which maximum particle sizes grade from fine sand near the base to gravel at the upper surface. This material is overlain disconformably by fine-grained overbank deposits of dominantly non-glacial origin. Entrenchment of these materials by the Ohio River formed the terrace tracts present in this reach of the Ohio River Valley.—Author's summary

Stuckless, John S. *See* Sheridan, Michael F. 00814

06898 **Stumm, Erwin C.** A redescription of the Middle Silurian compound rugose coral *Grabauphyllum johnstoni* Foerste: Michigan Univ. Mus. Paleontology Contr., v. 22, no. 6, p. 71–73, illus., 1968.

The holotype of *Grabauphyllum johnstoni* Foerste (1917, p. 199–200, pl. 11, fig. 9) from the Niagaran dolomite of the Chicago region was described from a cast of the calyxes. The specimen is apparently lost. Two specimens, the first another cast of the calyxes and the second showing the internal structures, are described and illustrated.—Author's abstract

06902 **Stumm, Erwin C.** Rugose corals of the Silica Formation (Middle Devonian) of northwestern Ohio and southeastern Michigan: Michigan Univ. Mus. Paleontology Contr., v. 22, no. 5, p. 61–70, illus., 1968.

The Silica Formation of Middle Devonian age, located in northwestern Ohio and southeastern Michigan, contains, in its lower part, a rich fauna of rugose corals. Four species of simple corals were previously reported from the formation. Four species of the compound genus *Hexagonaria* and one species of the compound genus *Billingsastraea* have been previously described. This paper reviews these species and describes a new species of *Stereolasma*, two new species of *Heliophyllum*, a species of *Cylindrophyllum*, one of *Cystiphylloides*, and two new species of *Cayugeae*—Author's abstract

Sturm, Edward. *See* Lodding, William. 07030

00872 **Suess, Erwin.** Calcium carbonate interaction with organic compounds [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 29, no. 7, p. 2499B, 1969.

00929 **Suess, Hans E.** Tritium geophysics as an international research project: Science, v. 163, no. 3874, p. 1405–1410, illus., 1969.

The unparalleled presence of artificial tritium on the Earth's surface, as a result of hydrogen bomb tests, provides a unique opportunity for the study of a large number of problems in environmental sciences. It can be used as a tracer for water vapor in the atmosphere, precipitation, runoff, and ground water on land, and for the various water masses of the oceans. A worldwide long range program is needed to make the best of the opportunities afforded. Such a program is now in progress at the International Atomic Energy Agency in cooperation with national and university laboratories in several countries. The program makes use of a precipitation sampling network organized jointly with the World Meteorological Organization. The work in progress is yielding immediate results in the field of arid region hydrology and in regard to problems of water supply and water contamination in developing countries.—D.B.V.

06888 **Summers, George E.** Geology of the Tatum salt dome, Lamar County, Mississippi [abs.]: Mining Eng., v. 20, no. 9, p. 109, 1968.

07025 **Sunderman, Jack A.** Geology and mineral resources of Washington Coundy, Indiana: Indiana Geol. Survey Bull. 39, 90 p., illus., tables, 1968.

Washington County, in south-central Indiana, contains parts of the Scottsburg Lowland, Norman Upland, Mitchell Plain and the Crawford Upland. Surface rocks and deposits are of Mississippian, Tertiary and Quaternary age. The average dip of surface rocks is about 25 feet per mile to the west-southwest. Local structural features include part of the Mt. Carmel Fault, the southern nose of the Leesville Anticline, and another small anticline in the south-central part of the county. Mineral resources of the county that have been used in the past include limestone, sand and gravel, gas, ground water, and surface water.—*from* Author's abstract

00790 **Suppe, John.** Franciscan geology of the Leech Lake Mountain—Anthony Peak region, northern Coast Ranges, California [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 65–66, 1969.

06947 **Suttner, Lee J.** Clay minerals in the Upper Jurassic–Lower Cretaceous Morrison and Kootenai Formations, southwest Montana: Earth Sci. Bull., v. 1, no. 4, p. 5–14, illus., tables, 1968.

Semi-quantitative X-ray analysis of 75 samples of Morrison and Kootenai shales, from 14 localities in southwest Montana, indicates that the clay mineralogy of the two formations is entirely compatible with earlier conclusions about their provenance and environment of deposition. Illite, the most abundant clay mineral in both formations, was probably derived from Paleozoic and Lower Mesozoic marine rocks in western Montana and eastern Idaho. Kaolinite is subordinate in the Morrison and chlorite subordinate in the Kootenai, a zoning that may reflect a significant change in source rock during deposition or a sudden change to a more arid climate. Paucity of montmorillonite and its concentration in extreme southern Montana is a function of the direction of volcanic ash dispersal in late Mesozoic, which would have little influence on deposition in most of southern Montana.—*from* Author's abstract

Swanson, D. A. *See* Walker, G. W. 00936

00791 **Swanson, Frederick J.** Size-shape relationships in coarse fluvial sediments, Elk River, southwestern Oregon [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 66, 1969.

00792 **Sylvester, A. G.; Nelson, C. A.; Barrows, Allan G.** Monzonite in the Inyo Batholith, east-central California [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 67, 1969.

Syono, Yasuhiko. *See* Akimoto, Syun-iti. 00985

00920 **Szasz, S. E.; Fantozzi, J. H.; Adent, William A.** Development of Long Beach Unit in offshore part of Wilmington field [abs.]: Am. Assoc. Petroleum Geologists Bull., v. 53, no. 2, p. 458, 1969.

Tackett, Stanford L. *See* Yates, Ann M. 06999

Tagg, A. R. *See* Hopkins, D. M. 06844

07049 **Tanaka, Teiji; Kanai, Kiyoshi; Osada, Kaio; Leeds, David J.** Observation of microtremors—[Pt.] 12, Case of the U.S.A. [with Japanese abs.]: Tokyo Univ. Earthquake Research Inst. Bull., v. 46, pt. 5, p. 1127–1147, illus., tables, 1968.

Observations of microtremors at strong-motion seismograph and seismoscope stations in the western United States in 1960 indicated that: (1) Variations of shape of the period distribution curve and of the predominant period of microtremors with time are much smaller than those in amplitude and are within limits allowable for application of microtremors to earthquake engineering; (2) period distribution and spectrum of microtremors show definite shapes for a particular site and closely resemble the spectrum developed from ground properties; and (3) similarity in shapes of period-distribution curves of strong earthquake motions and microtremors for a given site is fairly good. Ground in the United States varies greatly in dynamic behavior, and the need for quantitative consideration of effects of local ground conditions in aseismic design is great.—VSN

00982 **Tarr, Arthur C.** Rayleigh-wave dispersion in the North Atlantic Ocean, Caribbean Sea, and Gulf of Mexico: Jour. Geophys. Research, v. 74, no. 6, p. 1591–1607, illus., tables, 1969.

A technique is devised for analysis of surface-wave trains that cross the same area, so that regional dispersive character can be discerned. The new dispersion data are consistent with a typical oceanic crust under the deep-basin areas of the North Atlantic Ocean, a typical continental crust under the coastal margins of North and South America, a thin crust under the Mid-Atlantic Ridge, a slightly thickened crust under the Bermuda rise and the continental rise region northwest of Bermuda, an oceanic crust modified by thick layers of low-velocity sediments in the Guiana basin, the Gulf of Mexico, and the Caribbean Sea, a crust of greater-than-

continental thickness in Central America, and a mixture of crustal types in the Antilles arc. The data seem to indicate a transitional type of crust under the continental rise off North America.—*from* Author's abstract

00793 **Taubeneck, William H.** Granitic clasts in Pennsylvanian conglomerates of central Oregon [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 67–68, 1969.

00794 **Taubeneck, William H.** Plutonic clasts in Cretaceous conglomerates of central Oregon [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 68, 1969.

00795 **Taylor, Edward M.** A basalt welded tuff in the Cascade Range of Oregon [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 68–69, 1969.

06960 **Taylor, G. L.; Ruotsala, A. P.; Keeling, R. O., Jr.** Analysis of iron in layer silicates by Mössbauer spectroscopy [with French, German, and Russian abs.]: Clays and Clay Minerals, v. 16, no. 5, p. 381–391, illus., tables, 1968.

Mössbauer spectra were obtained for amesite, cronstedtite, nontronite, two glauconites, biotite, lepidomelane, chlorite, minnesotaite, vermiculite, stilpnomelane, and chloritoid. Trivalent iron was detected in tetrahedral coordination. Abundant trivalent iron in octahedral coordination apparently decreases quadrupole splitting values of divalent iron in the same mineral. This phenomenon was noted in cronstedtite and glauconite. In cases where divalent iron predominates, the quadrupole splitting is larger. It is generally accepted that ferrous iron is largely in octahedral coordination, suggesting that octahedral sites may be more distorted when ferric iron is present in the octahedral sheet. In biotite, quadrupole splitting of divalent iron is decreased when trivalent iron is present in tetrahedral sheets, so there is also more distortion in the octahedral sheet because of iron in tetrahedral positions.—*from* Authors' abstract

00927 **Teng, Ta-Liang; Richards, Paul G.** Diffracted P, SV, and SH waves and their shadow boundary shifts: Jour. Geophys. Research, v. 74, no. 6, p. 1537–1555, illus., 1969.

Diffraction of plane body waves caused by a cylindrical cavity in an otherwise homogeneous, elastic, and infinite medium has been studied in the neighborhood of the shadow boundary for wave periods up to 100 sec. A numerical study is also conducted of the behavior of diffracted amplitudes near the shadow boundary. It is found that the transitional zone between the illuminated and the shadow regions broadens, together with a shadow-boundary shift, as frequency decreases. With a scatterer of stress-free boundary condition, the shadow boundary shifts toward the illuminated region in both P- and SV-wave cases, with the amount of shift in the SV-wave case being appreciably larger. With the same boundary condition, the SH-wave shadow boundary shifts toward the shadow region instead, with large SH amplitudes extending deep into the shadow zone.—*from* Authors' abstract

Tetzloff, Clifford. *See* Somers, Lee H. 07095

00796 **Theodore, Ted G.; Blake, David W.** Geochemistry and geometry of the pyritic halo around the Copper Canyon stock at Iron Canyon, Lander County, Nevada [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 69, 1969.

00797 **Theodore, Ted G.; Christie, John M.** Mylonites and mylonitic gneisses—Correct use of the terms [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 69–70, 1969.

00937 **Thill, Richard E.; Bur, Thomas R.** An automated ultrasonic pulse measurement system: Geophysics, v. 34, no. 1, p. 101–105, illus., 1969.

An ultrasonic pulse technique for studying the elastic behavior of rock is described in this paper; it is automatic and permits continuous monitoring of elastic wave

traveltime. Once set up, the system can record elastic wave traveltime at a preset rate for nearly any time period without intervention by an operator. This system has been used to study effects of environment on longitudinal pulse velocity in several rocks and to make other preliminary investigations of longitudinal pulse velocity variations in rock under external influences.—KAF

Thompson, Don S. *See* Snow, Phillip D. 07008

07021 **Thompson, Robert Wayne.** Tidal flat sedimentation on the Colorado River delta, northwestern Gulf of California: Geol. Soc. America Mem. 107, 133 p., illus., tables, 1968.

Barren mud and salt flat deposits cover 2000 sq km and are about 16 m thick. Maximum spring-tide range is 8 to 10 m. Morphologic units are: high flats, at the level of extreme spring tides; intertidal zone; subtidal zone, extending to 11–12 m below mean sea level. Sediment types in seaward sequence are: chaotic muds and evaporites; brown well-laminated clayey silts, brown to gray mottled silty clays, gray poorly laminated silty clays. Silts and clays are derived from suspended load of the Colorado River, carried by Gulf tidal currents. The mud flats grew by depositional regression, which began during late Wisconsin sea-level rise when accretion exceeded dispersal by waves. Modern and older (1000–1500 yr B.P.) beach ridges resulted from low mud supply when the Colorado River was diverted into the Salton Basin.—VMJ

Thordarson, William. *See* Winograd, Isaac J. 06824

Thorpe, A. N. *See* Gilchrist, J. 00934

00731 **Tilling, Robert I.; Gottfried, David.** Radiogenic heat production of comagmatic rocks [abs.]: EOS (Am. Geophys. Union Trans.), v. 50, no. 4, p. 315, 1969.

Toksöz, M. N. *See* Lacoss, R. T. 00945

Traversy, W. J. *See* Chawla, V. K. 07092

06972 **Travis, Maury M.** Revolution in energy fuels and minerals: Earth Sci. Bull., v. 1, no. 3, p. 17–18, 1968.

A new era is completely revamping the entire kaleidoscope of energy, wherein formal earth sciences also have merged the various components of geology, geophysics, geoengineering, chemical engineering, geochemistry and all other geo-sciences in the unified conception of earth resources. Reduction in supply of oil and gas in the United States is transforming exploration to the offshore continental shelf, proliferating nuclear power plants, combining marine crude oil with vegetable coal, upgrading Canadian tar sands by hydrogenation, and downgrading our western nonmarine "oil shale". Second only to major developments in oceanography and oceanology, is the current second uranium boom in the revolution of energy fuels and minerals. A complete reorientation of thinking, training and application of hitherto sacrosanct specialized sciences and technologies is required.—GDC

00722 **Trescott, Peter C.; Pinder, George F.; Jones, John F.** Digital model of an alluvial aquifer at Antigonish, Nova Scotia [abs.]: EOS (Am. Geophys. Union Trans.), v. 50, no. 4, p. 153, 1969.

Trexler, J. Peter. *See* Wood, Gordon H., Jr. 00756

Trost, L. C. *See* Owens, John S. 06881

00721 **Turcan, A. N., Jr.; Winslow, A. G.** Quantitative mapping of salinity, volume, and yield of saline aquifers using borehole geophysical logs [abs.]: EOS (Am. Geophys. Union Trans.), v. 50, no. 4, p. 151, 1969.

00922 **Turcotte, D. L.; Oxburgh, E. R.** Convection in a mantle with variable physical properties: Jour. Geophys. Research, v. 74, no. 6, p. 1458–1474, illus., tables, 1969.

Using spreading rates obtained from magnetic anomaly data, the temperature distribution in the thermal boundary layers adjacent to the ocean floors is determined. A temperature distribution in the upper mantle is obtained by matching the boundary-layer profiles to adiabatic profiles consistent with the boundary-layer theory for finite amplitude convection. Mechanisms for a fluid-like mantle are considered. A semi-empirical expression for the temperature and pressure dependence of the viscosity is given. The viscosity is found to have a strong minimum near 100-km depth. The effect of a strong temperature-dependent viscosity on the ascending, diverging flow near ocean ridges is studied. The topography of ocean ridges is attributed to the hydrostatic head required for the horizontal flow. The excess temperature associated with the ascending flow is found to be of the order of 50°K.—*from* Authors' abstract

06913 **Turner, A. Keith; Miles, Robert D.** Terrain analysis by computer: Indiana Acad. Sci. Proc. 1967, v. 77, p. 256–270, illus., tables, 1968.

The first part of this paper discusses the development of suitable terrain sampling procedures. Reproducible sampling is an important prerequisite to satisfactory terrain analysis. Terrain variability measures have been developed to differentiate between unique terrain types. The results of these analyses are used to develop stratified samples of compound areas covering entire map sheets. Several computer-oriented terrain analysis methods have been developed and are described in the second part of this paper. Some of these methods are extensions of previously developed or suggested geomorphic techniques in which the computer is used to expedite procedures; other methods are new developments. Examples of computer-prepared contour maps are included. Such maps are useful for rapid study and comparison of different terrain types.—Authors' abstract

00798 **Turner, Donald L.** K-Ar ages of California coast range volcanics—Implications for San Andreas Fault displacement [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 70, 1969.

06966 **Turner, J. D.; Scott, J. C.; McCain, J. F.; Avrett, J. R.** Water availability, Covington County, Alabama: Alabama Geol. Survey Map 67, scale about 1 in. to 2 mi., section, separate text, 1968.

Formations underlying Covington County consist of alternating beds of permeable sand and limestone interbedded with relatively impermeable clay and marl. Major aquifers are: northern—Nanfalia and Porters Creek Formations; central—Tuscahoma Sand and Tallahatta and Hatchetigbee Formations; southern—Lisbon and Moodys Branch Formations, Ocala Limestone, Yazoo Clay, and the Oligocene Series. Ground-water is satisfactory for most uses, but hardness and objectionable amounts of iron are problems. Tabulated information in the text includes geologic units and water-bearing characteristics, records of wells and springs, chemical analyses of water from wells and springs, and streamflow and chemical quality data.—MCM

Tutt, D. B. *See* Quigley, R. M. 07090

07060 **Uchupi, Elazar.** Seismic profiling survey of the east coast submarine canyons—Pt. 1, Wilmington, Baltimore, Washington and Norfolk Canyons: Deep-Sea Research, v. 15, no. 5, p. 613–616, illus., 1968.

Seismic profiler recordings indicate that the morphology of Wilmington, Baltimore, Washington, and Norfolk Canyons are erosional not structural in origin. No evidence of folding or faulting was observed on any of the profiles.—Author's abstract

Ulrich, H. P. *See* Post, Donald F. 06903

00846 **U.S. Geological Survey.** Bibliography of North American geology, 1965: U.S. Geol. Survey Bull. 1235, 1144 p., 1969.

00953 **U.S. Geological Survey.** Aeromagnetic map of the Windsor Locks quadrangle and part of the Hartford North quadrangle, Hartford County, Connecticut: U.S. Geol. Survey Geophys. Inv. Map GP-646, scale 9;24,000, 1969.

00954 **U.S. Geological Survey.** Aeromagnetic map of the Putnam quadrangle and part of the Danielson quadrangle, Windham County, Connecticut: U.S. Geol. Survey Geophys. Inv. Map GP-652, scale 1:24,000, 1969.

00955 **U.S. Geological Survey.** Aeromagnetic map of Beach Hill and vicinity, New Hampshire and Vermont: U.S. Geol. Survey Geophys. Inv. Map GP-656, scale 1:62,500, 1969.

00960 **U.S. Geological Survey.** Water wells and springs in the Fremont Valley area, Kern County, California: California Dept. Water Resources Bull. 91-16, 157 p., illus., tables, 1969.

This bulletin is one of a series on water wells and springs in southern California desert areas. Each bulletin locates water wells and springs in a part of the region; describes well depth and yield, water use and level on dates observed; names the well owner; provides pumping data, including depths, rates, static water levels, drawdowns, and specific capacities; and lithologic data from drillers' well logs.—*from* Author's abstract

07055 **Vali, V.; Bostrom, R. C.** The use of a laser extensometer to observe strain in a large ground sample: Bull. Géod., no. 88, p. 151-157, illus., 1968.

This paper describes the design and construction of an experimental strainmeter which observes changes in the number of waves of light standing in a 1-km gap between points on the Earth's surface. Strain is observed over a frequency range of zero to several hundred hertz, to an accuracy of an arbitrarily small fraction of a wave length of light. Frequency-dependent phase and amplitude distortion are absent. As the read-out is of the nature of a servo device, dynamic range limitations are not encountered. The prototype of the instrument is located in the Cascade Range, a region affected by the world rift system.—DBV

06929 **Valiquette, Guy; Archambault, Ginette.** Géologie de la montagne de Brome [with English abs.], *in* Éditions spéciales du centenaire, 1868-1968—Sciences de la terre: Naturaliste Canadien, v. 95, no. 6, p. 1257-1276, illus., tables, 1968.

The Brome Complex of alkaline igneous rocks was emplaced during Lower Cretaceous within Cambrian and Ordovician sedimentary rocks. The gabbros were the first to intrude, followed by diorites, "monzodiorites", and a suite of alkaline syenites. The gabbro is clearly discordant with the sedimentary rocks, and the foliation and layering well developed in the gabbros show the influence of gravity on crystal settling. Field and petrographic data show syenite emplacement proceeded from quartz-bearing to nepheline-bearing syenites via nordmarkite, pulaskite, foyaite, tinguaite, and laurdalite. Mineral compositions and a study of the chemical relations suggest a petrogenetic evolution that parallels the order of rock emplacement. The Brome Complex is well suited for studying the silica undersaturation mechanism.—*from* Authors' abstract

VanAndel, S. I. *See* Hospers, J. 07064

06892 **Vaughan, Kenneth D.; Ackroyd, Earl A.** A preliminary report of a recently discovered aquifer at Sioux Falls, South Dakota: South Dakota Acad. Sci. Proc. 1968, v. 47, p. 68-74, illus., tables, 1968.

Test drilling for a southern outlet to the Big Sioux aquifer has led to discovery of the outlet and of a deeper aquifer than was previously known to exist in this area. This aquifer, herein called the Sioux Falls aquifer, was first recognized as a very clean gravel in test hole USGS no. 1 between the depths of 60 to 83 feet. Subsequent test drilling and aquifer testing has shown the Sioux Falls aquifer to be capable of producing several hundred gallons of water per minute. The chemical quality of this water surpasses that currently being used for the city supply. Further

investigation of the aquifer is planned as part of the continuing expansion of the water-supply facilities for Sioux Falls.—*from* Authors' abstract

00912 **Venkatarathnam, K.; McManus, Dean A.** Sediments of inner continental shelf off northern Washington coast [abs.]: Am. Assoc. Petroleum Geologists Bull., v. 53, no. 2, p. 461, 1969.

06859 **Vernon, R. O.** The geology and hydrology associated with a zone of high permeability (boulder zone) in Florida [abs.]: Mining Eng., v. 20, no. 12, p. 58, 1968.

00799 **Vitaliano, Charles J.** Cenozoic capping rocks, Goldfield-Tonopah region, Nevada [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 70–71, 1969.

00873 **Voight, Barry.** Structural studies in west-central Vermont—Pt. 1, Boudins; Pt. 2, The Sudbury nappe [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 29, no. 7, p. 2500B, 1969.

06963 **Volk, G. M.** Aggregation of mineral and organic matter in Ona and Leon fine sands: Soil and Crop Sci. Soc. Florida Proc. 1967, v. 27, p. 150–159, tables, 1968.

Samples collected from virgin and tilled Ona fine sand, and sodded and tilled Leon fine sand, were analyzed for both dry and water-stable aggregates. Aggregation of mineral separates into dry-stable aggregates>0.42 mm was relatively low for both soils, but their characteristics suggest a markedly different soil microstructure than would be expected for homogeneous singlegrain structure. Dry-stable aggregation of mineral separates in virgin Ona fine sand was 1.47 times that of tilled soil. The concentration of organic matter in dry-stable aggregates>2 mm ranged from 1.97 to 3.72 times that for the soil as a whole, while it ranged from 1.14 to 2.44 times that of the whole soil for aggregates from 1 to 2 mm in size. While the composition of water-stable aggregates differed in certain respects from that of dry-stable aggregates, the data did suggest the potential value of dry-stable aggregate analysis for sandy soils.—Author's abstract

00874 **Vredenburgh, Larry Dale.** Sulfur isotopic investigation of petroleum, Wind River Basin, Wyoming [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 29, no. 7, p. 2500B, 1969.

06905 **Wagner, Frances J. E.** Illustrated check-list of marine Pleistocene invertebrate fossils of Québec [with French abs.], *in* Éditions spéciales du centenaire, 1868–1968—Sciences de la terre: Naturaliste Canadien, v. 95, no. 6, p. 1409–1433, illus., 1968.

Marine fossils are found in the areas of the Province of Québec that were inundated at the close of the last Ice Age, and then raised above present sea-level. The areas involved are those bordering Hudson, James and Ungava Bays, along the St. Lawrence and Ottawa Rivers, and in the vicinity of Lake Saint-Jean. Two hundred and sixty-nine species are here recorded, both from the literature and from collections examined by the writer. Nomenclature of the species is brought up-to-date. The more common species are illustrated.—Author's abstract

00800 **Wagner, H. C.** Evidence for large post Middle Miocene right-lateral movement on San Andreas Fault in south-central California [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 71, 1969.

07023 **Wahlert, John H.** Variability of rodent incisor enamel as viewed in thin section, and the microstructure of the enamel in fossil and recent rodent groups: Breviora, no. 309, 18 p., illus., tables, 1968.

Measurements of enamel thickness and inclination bands in the inner enamel layer were made from sagittal sections on small samples of *Paramys copei* and *Knightomys depressus*. Differences in enamel dimensions between upper and lower incisors and between incisors of the fossils and living animals are apparent. These parameters could be used to identify isolated incisors when data are available for all rodents. Band width is of similar utility as the small size precludes all but rough

measurements. Korvenkontio's "external index" is unreliable. Pauciserial enamel, found only in Eocene and Oligocene forms, appears to be the structural predecessor of uniserial and multiserial enamels which occur in all post-Oligocene rodents examined.—*from* Author's abstract

00957 **Wahlstrom, Ernest E.** Optical crystallography (4th edition): New York, John Wiley and Sons, 489 p., illus., tables, 1969; originally published 1943.

With numerous expansions, corrections and deletions, this edition, as in previous ones, emphasizes graphical representation of the behavior of light as it passes through nonopaque substances viewed under the polarizing microscope. Much of the text is an elaboration and extension of diagrams prepared before it was written. The mathematical approach is more extensive than in the earlier edition, but is as simple and direct as possible without oversimplification.—GDC

00936 **Walker, G. W.; Swanson, D. A.** Discussion of paper by H. E. Wheeler and H. A. Coombs, "Late Cenozoic Mesa Basalt sheet in northwestern United States" [1967]: Bull. Volcanol., v. 32, no. 3, p. 581–585, 1969.

Wheeler and Coombs' (ibid., v. 31, p. 21–44, 1967) concept of a single Plio-Pleistocene volcanic event, during which basalt erupted in northern Oregon flowed south and southeast for more than 600 km, is inconsistent with many published reports and geologic maps as well as with much unpublished data collected during the past several years by many geologists working in the area. The petrochemical and structural features considered as diagnostic of a single flow by Wheeler and Coombs have been found in hundreds of flows of different known ages. Local vents have been recognized and mapped for many of the flows assigned to the so-called "Mesa Basalt." The Pliocene and Pleistocene topography was characterized by considerable relief; it is inconceivable that a single thin basalt flow was spread uniformly over such a vast and mountainous region.—DBV

00801 **Wallace, R. E.** Earthquake recurrence intervals on the San Andreas Fault [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 71–72, 1969.

Wallace, Robert E. *See* Silberling, N. J. 00958

07038 **Waller, Roger M.** Hydrologic effects in the Anchorage area, *in* The great Alaska earthquake of 1964—Hydrology, Pt. A: Natl. Acad. Sci. Pub. 1603, p. 82–96, illus., reprinted 1968; originally published 1966.

This paper with minor changes is reprinted from U.S. Geol. Survey Prof. Paper 544-B, 1966. See Abstracts of North American Geology for May 1967.—MCM

00875 **Walthall, Bennie Harrell.** Stratigraphy and structure, part of Athens Plateau, southern Ouachitas, Arkansas [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 29, no. 7, p. 2501B, 1969.

Wane, M. T. *See* Barla, G. B. 06828

00992 **Wang, Chi-yuen.** Equation of state of periclase and some of its geophysical implications: Jour. Geophys. Research, v. 74, no. 6, p. 1451–1457, illus., tables, 1969.

Ultrasonic and shock-wave data for periclase are examined and combined to yield several possible sets of parameters to relate shock velocity and particle velocity. This study shows that, as far as the pressure-density and the velocity-density relations are concerned, the present uncertainty in the equation of state of periclase is probably irrelevant for considerations of geophysical interest, but provides justification for the use of Birch's empirical velocity-density relation to yield, from seismic velocity, a rough approximation of density for the still inaccessible high-pressure minerals under large compression.—*from* Author's abstract

Wang, F. *See* Hopkins, D. M. 06844

Warner, Albert J. *See* Johnson, Gary D. 06982

00802 **Waters, Barbara K.; Savage, D. E.** Skeletal specializations in the Diprotodontidae (Mammalia; Marsupialia) [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 72, 1969.

06988 **Watrall, Charles R.** Analysis of unmodified stone materials from the Cambria Site: Minnesota Acad. Sci. Jour., v. 35, no. 1, p. 4–8, illus., 1968.

Analysis of stone materials from the Cambria Site, Blue Earth County, Minnesota reinforces cultural implications about the site made on artifact analysis, and demonstrates a simple method of analysis to gain vital information on archaeological site culture history. The archaeological terms chalcedony, jasper and chert as used here are clarified; properties of the various stone materials are compared; possible source areas included other states as well as Minnesota localities distant from the Cambria site. In the Cambria area a low ridge of quartzitic conglomerate, with pebbles varying in size up to boulders, could have been accessible, also outcropping knobs of granite, limestone and sandstone, and pebbles in glacial drift. Discrepancies in percentages of unmodified materials and raw materials used for artifacts are explained by need for conservation or ease of tooling.—GDC

06915 **Wayne, William J.** The Erie Lobe margin in east-central Indiana during the Wisconsin glaciation: Indiana Acad. Sci. Proc. 1967, v. 77, p. 279–291, illus., 1968.

The ice sheet that deposited the Trafalgar Formation during the Tazewell Subage became inactive east of White River after building the Knightstown Moraine and disappeared by downwasting. Patches of low-relief ice-disintegration hummocks cover much of the Tipton Till Plain in east-central Indiana south of the Union City Moraine, where kames, eskers, and ice-walled disintegration channels are the dominant geomorphic features of the landscape. The low Union City Moraine marks the margin in east-central Indiana of the Lagro Formation, a till sheet deposited by the Erie Lobe during the Cary Subage of the Wisconsin (glacial) Age. The moraine disappears as a recognizable topographic feature across Delaware County because in that region the Erie Lobe ice rode over the thin sheet of stagnant ice that still remained from the earlier advance that deposited the Trafalgar Formation.—Author's abstract

07040 **Weaver, Charles E.** Electron microprobe study of kaolin [with French, German, and Russian abs.]: Clays and Clay Minerals, v. 16, no. 2, p. 187–189, illus., table, 1968.

Electron microprobe studies of kaolinite indicate that most of the Fe is evenly distributed throughout the kaolinite and must either be in the structure or occur as very small particles adsorbed on the surface. In addition to Ti the anatase impurities contain Fe and Mg. Fe, Mg, Mn, V, and K are present in biotite. It is necessary to concentrate the fine-grained mineral impurities in order to study them with the electron microscope.—Author's abstract

Webster, Gary D. *See* Ovenshine, A. Thomas. 00635

00944 **Weddle, James R.** Chico-Martinez oil field: California Div. Oil and Gas, California Oil Fields—Summ. Operations 1968, v. 54, no. 1, p. 45–49, illus., tables, 1969.

The stratigraphic section penetrated in Chico Martinez field consists of more than 6,500 feet of sedimentary rocks ranging in age from Holocene to upper Miocene. The field is in a region of moderate folding and faulting near the western edge of the Tulare basin; structure is a north-south trending homocline slightly bowed toward the east. Oil accumulation, the result of the lensing nature of the Etchegoin sands coupled with their unconformable abutment against the Tulare Formation, does not seem to be affected by the fault. Sandstone lenses within the Etchegoin essentially comprise the producing zone. In more than 40 years, the field has produced only 150,000 bbl oil; a careful evaluation of all possible productive intervals should enhance the economic aspect.—MCM

07048 **Weertman, J.** Bubble coalescence in ice as a tool for the study of its deformation history: U.S. Army Materiel Command Cold Regions Research and Eng. Lab. Research Rept. 251, 5 p., illus., 1968.

An analysis is made of the rate of bubble coalescence in a deforming ice mass. A total strain of at least 8 is required before appreciable coalescence occurs. The analysis has been applied to deforming ice shelves and ice sheets. No appreciable coalescence is expected in ice shelves but coalescence should occur in ice sheets (or glaciers) if the shear strain rate at the bottom surface is of the order of of 0.075/yr or larger. Measurements of bubble concentration are capable of setting limits on paleo-strain rates of the present ice sheets. Bubble migration down temperature gradients presents complications to the study of bubble coalescence.—Author's abstract

00941 **Weichert, D. H.** Epicentre determination by seismic arrays: Nature, v. 222, no. 5189, p. 155, table, 1969.

Attention is drawn here to the fact that the second method of Lilwall and Douglas (1968) still uses $dT/d\Delta$ as a function of distance, even though corrections for the preliminary $dT/d\Delta$ are now calculated, along with epicenter and origin-time calculations. Their suggestion for using only the azimuth-determining properties of seismic arrays in epicenter determinations is welcomed; then the use of precise arrival-time data and traveltime tables, together with (preliminary) traveltime derivatives, can be rejected. For workers with convenient access to multiarray data, a simple trigonometric equation of condition given here is recommended for minimization studies.—DBV

07094 **Weiler, R. R.; Chawla, V. K.** The chemical composition of Lake Erie, *in* Conf. on Great Lakes research, 11th, Milwaukee, Wis., 1968, Proc.: Ann Arbor, Mich., Internat. Assoc. Great Lakes Research, p. 593–608, illus., tables, 1968.

The major and trace element concentrations during the summer and fall of 1967 in Lake Erie are presented. The distribution and concentration of ions in the main body of the Lake and at the mouth of various rivers is discussed in the light of the 1967 and earlier information. A brief discussion of the seasonal as well as long-term changes in the composition of the Lake is given.—Authors' abstract

00843 **Weir, Gordon W.; Schlanger, Seymour O.** Geologic map of the Woodstock quadrangle, south-central Kentucky: U.S. Geol. Survey Geol. Quad. Map GQ-776, scale 1:24,000, section, text, 1969.

Small quantities of oil and gas have been reported from several drill holes in the Woodstock quadrangle from the "Corniferous" rock which is commonly a few tens of feet thick, but no wells have proved commercial. A bed about five feet thick of dolomitic silty fine-grained sandstone was formerly quarried in the northeast corner. Rocks are in general poor aquifers.—MCM

00803 **Weis, Paul L.** Anomalous glacial erosion in part of the Skagit Valley, Washington [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 72–73, 1969.

00876 **Weiss, Richard Lawrence.** Outcrops as guides to copper ore—Four examples [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 29, no. 7, p. 2501B, 1969.

06860 **Wertz, J. B.** Fracture intersections and domes—Exploration guides in southern Arizona [abs.]: Mining Eng., v. 20, no. 12, p. 63, 1968.

West, G. F. *See* Scott, W. J. 00939

West, Terry R. *See* Lowell, Brent. 06908

Wetherill, G. W. *See* Bickford, M. E. 00986

Whetten, John T. *See* Hawkins, James W., Jr. 00671

00804 **Whistler, David P.** Later Tertiary lizards and snakes of the Mojave Desert [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 73, 1969.

00749 **White, Donald E.; Miller, Lee D.** Calibration of geothermal infrared anomalies of low intensity in terms of heat flow, Yellowstone National Park [abs.]: EOS (Am. Geophys. Union Trans.), v. 50, no. 4, p. 348, 1969.

White, Donald E. *See* Muffler, L. J. Patrick. 06896

White, Joe L. *See* Post, Donald F. 06919

00805 **Wiebe, Robert A.** Structure and stratigraphy in the Sur Series, northern Santa Lucia Range, California [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 73–74, 1969.

Wienke, Sally M. *See* Nayudu, Y. R. 00638

06916 **Wier, Charles E.** Stratigraphic classification of rocks of Pennsylvanian age in Indiana: Indiana Acad. Sci. Proc. 1967, v. 77, p. 292–298, illus., table, 1968.

Pennsylvanian rocks in Indiana exhibit rapid lateral and vertical variations. In order to divide these rocks at the formational level, certain requirements should be met, namely, homogeneity of type, distinctive lithology, reasonable lateral continuity, and appropriate thickness to be mappable and meet practical needs. In the formational classification of Pennsylvanian rocks these requirements must be compromised in that the formation may be heterogeneous but is readily recognized on the basis of marker beds at the top or bottom. Limestone and coal beds are the most distinctive and laterally persistent and therefore are most useful in marking the boundary of formational units. These distinctive beds, and certain sandstone beds have been designated as formal members. Each named member is one bed of a single lithology in some places but changes laterally and includes additional lithologic units in other places.—Author's abstract

00947 **Wilcoxon, J. A.** Tropical planktonic zones and calcareous nannoplankton correlations in part of the California Miocene: Nature, v. 221, no. 5184, p. 950–951, illus., 1969.

Calcareous nannoplankton assemblages in the Miocene rocks at Newport Beach, Calif., are described. Although more sparsely distributed, they are almost identical to those present in cores from the Mohole drilling and in equivalent strata of the tropics. The Luisian part of the Newport Beach unit is considered to be correlative with the *Globorotalia fohsi lobata* and *G. fohsi robusta* zones of Trinidad, whereas the Mohnian part of the unit is equivalent to the *G. mayeri* and *G. menardii* zones.—DBV

Wilcoxon, James A. *See* Bandy, Orville L. 00892

00972 **Wilkins, R. W. T.; Farrell, E. F.; Naiman, C. S.** The crystal field spectra and dichroism of tourmaline: Jour. Physics and Chemistry Solids, v. 30, no. 1, p. 43–56, illus., tables, 1969.

Optical absorption spectra of colorless, pink, green, blue, brown, and black tourmaline were taken to determine the origin of colors and explain color changes on heating. Data taken with polarized radiation parallel and perpendicular to the *c* axis at 77 and 300°K showed that color is due to electronic transitions in the crystal, and the amount of Fe^{2+}, Fe^{3+}, and Mn^{2+}. Specimens on the dravite–schorl join and those on the elbaite–schorl join differ in color. Intensity changes of absorption peaks and shifts in absorption edges, correlated with removal of hydrogen and oxidation of iron, account for color changes when heated in air. Blue becomes green on short term heating and reddish-brown on further heating. Assignments of absorption peaks from 0.3 to 2.0 μ to specific transitions in appropriate cations have been made and origin of the dichroism is discussed.—*from* Authors' abstract

00964 **Wilkinson, Elbert R.** Barham Ranch oil field: California Div. Oil and Gas, California Oil Fields—Summ. Operations 1968, v. 54, no. 1, p. 31–36, illus., tables, 1969.

The rather vague physiographic boundaries of the Barham Ranch field are loosely considered as a triangle formed by the San Rafael Mts. to the northeast, the Santa Ynez Mts. to the south, and the sand dunes along the Pacific Ocean. Oldest rocks penetrated are those of the Miocene Monterey Formation which has been divided into five zones based primarily on lithology. Future development of the field is dependent upon locating areas within the reservoir where the shale is highly fractured and the fractures interconnected to a degree that will allow commercial production. Reservoir conditions would appear to be most favorable in the immediate vicinity of faults.—MCM

00968 **Willard, R. J.; McWilliams, J. R.** Microstructural techniques in the study of physical properties of rock: Internat. Jour. Rock Mechanics and Mining Sci., v. 6, no. 1, p. 1–12, illus., tables, 1969.

The techniques measure fabric parameters on rock disks and in thin sections, for correlation with physical property laboratory tests. The five types of analyses are: diametric mineralogic, defect, grain elongation, macro-grid, and transgranular-intergranular. Pulse velocities and breaking strengths in granite and limestone are compared with the fabric properties obtained. Examples include: the influence of feldspar and quartz abundance in Salisbury Granite on longitudinal pulse velocity, the tendency for frequency of microscopic defects to be inversely proportional to breaking strength in Barre Granite, the inverse proportionality of average grain size parallel with foliation to breaking strength in Yule Marble, and inverse proportionality of the ratio of transgranular to intergranular failure to breaking strength in Tennessee marble.—*from* Authors' abstract

06861 **Willard, R. J.** Scanning electron microscopy in rock behavior research [abs.]: Mining Eng., v. 20, no. 12, p. 51, 1968.

Willden, Ronald *See* Kistler, Ronald W. 00655

00806 **Williams, C. Thomas.** Evolution of the Caninae and Borophaginae (Canidae) [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 74, 1969.

00807 **Williams, C. Thomas.** Late Pleistocene marine terraces of San Pablo Bay, California [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 74–75, 1969.

07035 **Williams, John R.** Availability of ground water in the northern part, Tenmile and Taunton River basins, southeastern Massachusetts: U.S. Geol. Survey Hydrol. Inv. Atlas HA-300, scale 1:31,680, text, 1968.

The principal aquifers, which occupy about 7 percent of the area of the Tenmile and Taunton River basins, consist of stratified, fine to coarse sandy gravel and vary in thickness from 20–90ifeet, with many local variations. Yield of bedrock wells ranges from 8–100 gpm; estimated average annual sustained yield is about 31 mgd. Water is generally low in hardness and suitable for most uses; in widely scattered areas objectionable amounts of iron or manganese are present.—MCM

Williams, Joseph D. *See* Logan, Brian W. 00763

Williams, K. L. *See* Campbell, F. A. 06975

Williams, William P. *See* Fernald, Arthur T. 06825

Willis, Eric H. *See* Buckley, James D. 00834

Wilmeth, R. *See* Lowdon, J. A. 00833

06938 **Wilson, Richard Leland.** Systematics and faunal analysis of a Lower Pliocene vertebrate assemblage from Trego County, Kansas: Michigan Univ. Mus. Paleontology Contr., v. 22, no. 7, p. 75–126, illus., tables, 1968.

The WaKeeney local fauna, screened from sediments of the Ogallala Formation, represents a vertebrate community that lived in a river and adjoining land environments. Seventy-six taxa are discussed: 11 fishes; 13 amphibians (one n.sp.); 15 reptiles (4 n.spp.); 3 birds; 34 mammals (3 n.gen., 7 n.spp., including a new genus of shrew and 2 new genera of cricetids). The Lower Pliocene environment of the site is interpreted from geological data, individual habitat of each member of the local fauna, and evidence from other faunas and floras. Stratigraphically the sediments represent the channel margin of an aggrading river, which moved laterally to the south and cut into its own floodplain. Certain groups of the fauna indicate a humid, subtropical climate.—VMJ

06824 **Winograd, Isaac J.; Thordarson, William.** Structural control of ground-water movement in miogeosynclinal rocks of south-central Nevada, *in* Nevada Test Site: Geol. Soc. America Mem. 110, p. 35–48, illus., 1968.

Regional carbonate aquifer systems in the eastern Great Basin are compartmentalized by major structural features. In south-central Nevada major wrench, thrust, and normal faults markedly control ground-water movement. Deformed carbonate rocks produce regions of high transmissibility; thick clastic strata juxtaposed against carbonate aquifers form barriers, some more than 10 miles long. Barriers may also result from gouge along major fault zones. Apparent hydraulic gradients across clastic aquitards vary from 150 to 1,300 ft/mile in contrast to 0.5 to 10 ft/mile in adjacent carbonate aquifers. In uplands the clastic aquitards may control recharge, in central parts they act as prominent ground-water dams, and in discharge areas, localize major spring lines. Major structures with hydrologic reflections include the Las Vegas Valley shear zone and thrust fault.—*from* Authors' abstract

Winslow, A. G. *See* Turcan, A. N., Jr. 00721

Winter, J. K. *See* Langenheim, R. L., Jr. 00657

07061 **Winterer, E. L.; Curray, J. R.; Peterson, M. N. A.** Geologic history of the intersection of the Pioneer Fracture Zone with the Delgada Deep-Sea Fan, northeast Pacific: Deep-Sea Research, v. 15, no. 5, p. 509–520, illus., 1968.

Continuous reflection profiles of the region where Pioneer Fracture Zone intersects Delgada Deep-Sea Fan (39°N., 127°W.) show that the top of the seismic second layer is displaced along the fracture zone, but that overlying sediments are undisturbed. These sediments have completely buried Pioneer Ridge where it intersects the continental slope, the shape of which is modified locally by an extra cone of sediment, the Delgada Fan. Where the total column is less than 500 m thick, the physiography of the sediments is strongly influenced by relief of the underlying seismic second layer. The mineralogical uniformlty of fine sediments suggests that the California Current delivered Columbia River Basin sediments over the past 10 m.y. to form the continental rise; the Delgada Fan was superimposed during Quaternary.—*from* Authors' abstract

06862 **Wisecarver, D. W.; Merrill, R. H.; Stateham, R. M.** The microseismic technique applied to slope stability [abs.]: Mining Eng., v. 20, no. 12, p. 51, 1968.

00736 **Wones, David R.; Hon, Rudolph; Bateman, Paul C.** Depth of crystallization of a garnet-bearing quartz monzonite of the Sierra Nevada batholith [abs.]: EOS (Am. Geophys. Union Trans.), v. 50, no. 4, p. 329, 1969.

00756 **Wood, Gordon H., Jr.; Trexler, J. Peter; Kehn, Thomas M.** Geology of the west-central part of the Southern Anthracite field and adjoining areas, Pennsylvania: U.S. Geol. Survey Prof. Paper 602, 143 p., illus., tables, 1969.

A comprehensive description is given of the stratigraphy, structure, regional tectonics, geologic history, and economic geology of 450 mi of the Anthracite region

of eastern Pennsylvania. The report area is underlain by 24,500± feet of Middle Ordovician to Upper Pennsylvanian rocks that have been affected by the Taconic, Acadian, and Appalachian orogenies. The lower 8,000 to 9,600 feet of these rocks accumulated largely in the sea, and the remainder under continental conditions. Original anthracite resources are estimated to have been 7.6 billion tons; 5.2 billion tons of virgin anthracite are estimated to lie within 3,000 feet of the surface as of January 1, 1961. Production from 1769 to 1961 is estimated at 318 million tons valued at 1.1 billion dollars.—GHW

Woodward, H. W. *See* Hunt, A. D. 07081

07037 **Worrall, W. E.** Clays—Their nature, origin and general properties: New York, Transatlantic Arts, 128 p., illus., tables, 1968.

This short treatise on clays has been written to serve as a textbook introductory to the study of ceramics at the college level. Topics covered include: crystal structure of clay minerals, analytic and microscopic methods for clay-mineral identification, occurrence and geology of natural clays (all examples are from localities in England), general properties of the industrial types of natural clays, theory of drying and effect of heat on clays, chemical and physical processes of clay-water systems, rheology and plasticity. Throughout, emphasis is on the ceramic properties of the clays.—VMJ

06863 **Worthington, J. E.; Kiff, I. T.** A suggested volcanigenic origin for certain gold deposits in the Slate Belt of the North Carolina Piedmont [abs.]: Mining Eng., v. 20, no. 12, p. 67, 1968.

Wright, Ramil C. *See* Bandy, Orville L. 00882

Wright, Ramil C. *See* Bandy, Orville L. 00887

Wright, Thomas L. *See* Jackson, Everett D. 00747

Wrucke, C. T. *See* Silberman, M. L. 00809

00808 **Wrucke, Chester T.; Armbrustmacher, Theodore J.** Structural controls of the gold deposit at the open-pit mine, Gold Acres, Lander County, Nevada [abs.]: Geol. Soc. America Abs. with Programs 1969, pt. 3, Cordilleran Sec., p. 75, 1969.

Wu, S. M. *See* DeGeoffroy, J. 06944

Wyatt, P. Y., 3d. *See* Fischer, Irene. 07077

Yang, J. J. *See* Stoermer, E. F. 07085

06999 **Yates, Ann M.; Tackett, Stanford L.; Moore, Carleton B.** Chromium and manganese in chondrites: Chem. Geology, v. 3, no. 4, p. 313–322, illus., tables, 1968.

Chromium and manganese were determined in 15 L group, 12 H group and eight carbonaceous chondrites using an X-ray fluorescence technique. Although gross fractionation of chromium between H and L group chondrites indicated in Urey and Craig's (1953) compilation of analyses was not found in this work, the L group appears to be depleted in chromium. Determined ratios for Mn: Cr are H group 0.57±0.02, L group 0.63±0.03; abundances relative to silicon are calculated. A direct relation is found between chromium and manganese in both groups, but an inverse relation between these two elements is indicated for carbonaceous chondrites.—*from* Authors' abstract

00908 **Yeats, Robert S.** Anacapa rift, California [abs.]: Am. Assoc. Petroleum Geologists Bull., v. 53, no. 2, p. 460, 1969.

Yen, Meei-Meei. *See* Bandy, Orville L. 00887

Zartman, R. E. *See* Bass, M. N. 00730

Zartman, R. E. *See* Stacey, J. S. 06945

06864 **Zietz, I.** The search for ore deposits using widely spaced aeromagnetic profiles [abs.]: Mining Eng., v. 20, no. 12, p. 58, 1968.

00974 **Zimmermann, Robert C.** Plant ecology of an arid basin, Tres Alamos–Redington area, southeastern Arizona: U.S. Geol. Survey Prof. Paper 485-D, p. D1–D51, illus., tables, 1969.

The area comprises 750 sq mi of the middle reach of San Pedro Valley, a structural trough in the Basin and Range province; valley fill several miles wide and locally >1000 ft thick is flanked by mountains of Precambrian–Mesozoic faulted bedrock. Average annual rainfall is about 12 inches. Drainage area, geology, and flow regimen are the most important controls of valley-floor vegetation; with uniform geology and ephemeral flow, differentiation from upland vegetation increases with increasing drainage area. Sustained flows eliminate the effects of drainage area and geology (relative moisture retention of substrate). Optimum valley-floor width, fill thickness, and sustained base flow may support a closed-canopy forest; however, too-thick fill, with intermittent flow, supports only desert species. Most valley-floor vegetation grows independently of regional water tables.—VMJ

07046 **Zonneveld, J. I. S.** Bonaire: Koninkl. Nederlands Aardrijksk. Genoot. Geog. Tijdschr., new ser., v. 2, no. 4, p. 536–540, illus., 1968.

Bonaire is the second in size of the six small islands in the Netherlands Antilles; its surface, including that of Klein Bonaire, is 288 sq km, and the highest hill, Brandaris, rises not more than 240 m above sea level. The core is mainly Cretaceous volcanic rocks, outcropping in the northern and east-central parts. Elsewhere a cap of Quaternary limestone includes eolianites. During Quaternary times coral reefs grew along the shoals and coasts, below which were submarine detrital shelves, dipping outward with slopes up to 25°; falling sea level and some tectonic upheaval caused the island and its coral reefs to rise interruptedly, resulting in marine terraces, cliff coasts, barrier reefs, and lagoons which collected carbonaceous muds and eolian sands. Interglacial rises of sea level drowned some river basins, forming finger shaped bays.—GDC

INDEX

[The numbers refer to entries in the abstracts]

Absolute age, dates
Basement rocks
Lead models, Utah: Stacey, J. S. 06945
Bone
California, Sacramento area, Fair Oaks Fm., ionium–uranium: Shlemon, Roy J. 00784
Carbon–14
California, Sacramento area, Riverbank Fm., wood: Shlemon, Roy J. 00784
Canada, Geological Survey of Canada list: Lowdon, J. A. 00833
Canada, National Physical Laboratory list: Callow, W. J. 00835
Canada, Uniersity of Wisconsin list: Bender, Margaret M. 00839
General listing, ISOTOPES': Buckley, James D. 00834
General listing, Smithsonian Institution: Mielke, James E. 00837
General listing, UCLA laboratory: Berger, Rainer. 00823
General listing, U.S. Geological Survey: Marsters, Beverly. 00838
Oregon, Cape Blanco area, marine terraces: Janda, Richard J. 00665
Quebec, Manicouagan River valley, barnacle in clay: Sauve, Pierre. 06931
United States, Bahamas, Florida State University list: Martin, J. R. 0083;
United States, Ohio Wesleyan University list: Ogden, J. Gordon, 3d. 00836
Granite
Montana, Jardine–Crevice Mtn. area: Brookins, Douglas G. 06974
Granitic rocks
California, Mesozoic plutons, K–Ar, Rb–Sr: Evernden, J. F. 00738
Igneous rocks
Colorado, Needle Mountains, Precambrian chronology: Bickford, M. E. 00986
Colorado, Unaweep Canyon, Precambrian chronology: Mose, Douglas, G. 00987
Nevada, Tenabo area, intrusions, K–Ar: Silberman, M. L. 00809
Ignimbrite
Nevada, Fish Creek Mts. volcanic center: McKee, Edwin H. 00649
Interpretation
California, Oregon, Klamath Mts., plutonic, metamorphic events: Lanphere, Marvin A. 00658
California, San Andreas fault, displacement: Turner, Donald L. 00798
Nevada, southern, normal fault systems: Ekren, E. B. 06795
Metamorphic rocks
Montana, Jardine–Crevice Mtn. area: Brookins, Douglas G. 06974
Nevada, Ruby Mountains, Rb–Sr: Kistler, Ronald W. 00655
Minerals
Florida, central, basement rocks: Bass, Manuel N. 00769
Absolute age, dates
Minerals
United States, southeastern, Precambrian volcanics, zircon, Pb–U: Rankin, D. W. 00740
Sediments
Caribbean Sea, cores, Th–230—Pa–231: Rona, E. 00978
Volcanics
Maine, Penobscot Bay, Rb–Sr: Brookins, D. G. 00741
Nevada, Humboldt County, glass: Noble, Donald C. 00641
Nevada, Nye and Esmeralda Counties: Kistler, Ronald W. 06796
Utah, Bull Valley district, K–Ar: Blank, H. Richard. 00679
Absolute age, methods
Carbon–14
Isotope fractionation during oxalic acid oxidation: Grey, D. C. 00831
Potassium–argon
Isochron diagram: McDougall, Ian. 00737
Mineral pairs, precision: Kistler, Ronald W. 06796
Th–230—Pa–231
Ocean sediments: Rona, E. 00978
Alabama
Economic geology
Mineral resources, Conecuh County: Reed, Philip C. 07050
Hydrogeology
Conecuh County, water resources: Reed, P. C. 07071
Covington County, ground–water resources: Turner, J. D. 06966
Crenshaw County, water resources: McWilliams, R. G. 07074
Henry County, water resources: Newton, J. G. 07075
Pike County, water resources: Shamburger, V. M., Jr. 07070
Maps, geologic
Conecuh County: Reed, Philip C. 07050
Maps, ground water
Conecuh County: Reed, P. C. 07071
Covington County: Turner, J. D. 06966
Crenshaw County: McWilliams, R. G. 07074
Dale County: Newton, J. G. 07073
Henry County: Newton, J. G. 07075
Pike County: Shamburger, V. M., Jr. 07070
Stratigraphy
Tertiary–Quaternary, Conecuh County: Reed, Philip C. 07050
Alaska
Absolute age
C–14, ISOTOPES' list: Buckley, James D. 00834
C–14, Smithsonian Institution list: Mielke, James E. 00837
C–14, U.S. Geological Survey list: Marsters, Beverly. 00838
Earthquakes
1788, Sanak–Kodiak tsunami: Solov'yev, S. E. 07054

Alaska
Earthquakes
March 28, 1964, effects, glaciers: Post, Austin S. 07003
March 28, 1964, effects, Montague Island: Kirkby, M. J. 00977
March 28, 1964, hydrologic effects, Anchorage area: Waller, Roger M. 07038
Economic geology
Placers, fuels, Bering Sea, possibilities: Hopkins, D. M. 06844
General
Geologic archeology, interior: Hamilton, Thomas D. 00686
Geomorphology
Montague Island, shoreline changes, 1964 earthquake: Kirkby, M. J. 00977
Geophysical surveys
Nome area, gold placers, seismic, instruments: Greene, H. Gary. 00902
Glacial geology
Brooks Range, central, history: Hamilton, Thomas D. 00687
Earthquake effects, March 1964: Post, Austin S. 07003
Glaciers, earthquake effects, pre-1964: Field, William O. 07039
Hydrogeology
Anchorage area, earthquake effects, March 1964: Waller, Roger M. 07038
Paleontology
Conodonts, Silurian, southeastern: Ovenshine, A. Thomas. 00635
Flora, Cretaceous, Nanushuk and Colville Groups, northern: Smiley, Charles J. 00779
Pteridophytes, Eocene, Adak Island: Scholl, David W. 00906
Petrology
Nunivak Island, volcanics: Hoare, J. M. 00672
Sedimentary petrology
Southeastern, Silurian–Devonian clastic wedge, lithofacies: Ovenshine, A. Thomas. 00634
Stratigraphy
Eocene, *Annularia*-bearing beds, Adak Island: Scholl, David W. 00906

Alberta
Absolute age
C-14, University of Wisconsin list: Bender, Margaret M. 00839
Economic geology
Oil sands, Athabasca tar, reserves, potential: McClements, Robert, Jr. 07084
Petroleum, northeastern, Senex discovery: Gagnon, Paul M. 00822

Algae
Geochemistry
Lipid and fatty acid content, possible dating method: Das, Salil K. 07045
Ordovician
Nevada, Pogonip Group: Pierce, R. W. 00816

Amphibia
Tertiary
Kansas, Trego County, WaKeeney local fauna: Wilson, Richard Leland. 06938

Anthozoa
Grabauphyllum johnstoni
Silurian, Illinois, Chicago area, redescription: Stumm, Erwin C. 06898
Pseudofavosites
Pennsylvanian, Kansas–Oklahoma, species assigned to *Sutherlandia*: Cocke, J. M. 06800
Rugosa
Devonian, Michigan–Ohio, Silica Formation, fauna, n.spp.: Stumm, Erwin C. 06902
Sutherlandia n.gen. n.spp.
Pennsylvanian, Kansas–Oklahoma, favositid: Cocke, J. M. 06800

Appalachians
Areal geology
Popular account: Connelly, Thomas L. 06969
Geomorphology
Popular account: Connelly, Thomas L. 06969

Arctic
Geomorphology
Meteor craters, distribution, Canada, Alaska, Greenland: Sandner, Werner. 06955

Arizona
Economic geology
Copper, Kalamazoo–San Manuel orebody, alteration zones: Guilbert, J. M. 06839
Copper, porphyry deposits, cappings as ore guides: Weiss, Richard Lawrence. 00876
Ore deposits, structural guides: Wertz, J. B. 06860
Geomorphology
San Pedro Valley, arid basin, plant ecology, controls: Zimmermann, Robert C. 00974
Hydrogeology
Navajo and Hopi Indian Reservations, ground-water resources: Cooley, M. E. 00959
San Pedro Valley, arid basin, plant ecology, controls: Zimmermann, Robert C. 00974
Maps, geologic
Navajo and Hopi Indian Reservations: Cooley, M. E. 00959
Maps, ground water
Navajo and Hopi Indian Reservations: Cooley, M. E. 00959
Petrology
Black Mesa caldera, volcanics, eruptive sequence: Sheridan, Michael F. 00814
Structural geology
Lineations, Gemini and Apollo photography, implications: Lintz, Joseph, Jr. 00661
Southern, fractures, domes, intersections: Wertz, J. B. 06860

Arkansas
Areal geology
Coal Hill, Hartman, Clarksville quadrangles: Merewether, E. A. 00976
Maps, geologic
Coal Hill, Hartman, Clarksville quadrangles: Merewether, E. A. 00976

Arkansas
Stratigraphy
Carboniferous, Athens Plateau: Walthall, Bennie Harrell. 00875
Structural geology
Athens Plateau: Walthall, Bennie Harrell. 00875
Artifacts
Minnesota
Blue Earth County, Cambria Site, properties, source areas: Watrall, Charles R. 06988
Associations
Commission on Ore-Forming Fluids
Fluid-inclusion research: Roedder, Edwin. 06977
Geol. Soc. America, Rocky Mountain Section
Symposium, Nevada Test Site, 1966: Eckel, Edwin B. 06820
Scripps Institution of Oceanography
Glomar Challenger program, deep-sea sediment drilling: Field, A. J. 00905
Asterozoa
Morphology
Onychaster, Mississippian, mouth-frame plates: Bjork, Philip R. 06901
Onychaster
Mississippian, U.S., central, species distinction: Bjork, Philip R. 06901
Atlantic Coastal Plain
Paleontology
Ostracoda, Cenozoic, selected genera, morphology: Plusquellec, Paul Lloyd. 00865
Atlantic Ocean
Absolute age
C-14, U.S. Geological Survey list: Marsters, Beverly. 00838
Geophysical surveys
United States, continental margin, magnetic, interpretation: Keen, M. J. 00948
Sedimentary petrology
Deep-sea sediments, Glomar Challenger drilling program: Field, A. J. 00905
Structural geology
Antilles area, underthrusting by ocean: Chase, Richard L. 00928
Crustal structure, northern, Rayleigh-wave dispersion: Tarr, Arthur C. 00982
Automatic data processing
Geomorphology
Terrain analysis: Turner, A. Keith. 06913
Hydrogeology
Aquifer evolution technique, Nova Scotia: Pinder, George Francis. 00877
Nova Scotia, Antigonish, alluvial aquifer, model: Trescott, Peter C. 00722
Saline-water data, New Mexico, Texas, Delaware basin: Hiss, William L. 00719
Mineral exploration
Techniques, computer analysis: Rychkun, Edward A. 06884
Techniques, storage, retrieval: Eimon, Paul I. 06871
Uranium, resource prediction: Bostick, N. H. 06831
Automatic data processing
Mining geology
Open pits, computer applications: Adams, B. W. 06865
Sedimentary petrology
Sand-size analysis, aerodynamic data: Skaggs, R. W. 06899
Sedimentation
Transport near shore, computer simulation: Bonham-Carter, Graeme F. 00885
Seismic surveys
Continuous reflection parameter determination, application: Carter, Melvan D. 00899
Structure contouring
Bedrock surface, Indiana, Tippecanoe County: Lowell, Brent. 06908
Aves
Alcodes ulnulus, n.gen. n.sp.
Miocene(?), California, Laguna Hills: Howard, Hildegarde. 06803
Tertiary
California, Laguna Hills, Miocene(?) fauna, bone: Howard, Hildegarde. 06803
Bacteria
Thiobacillus thiooxidans
U. S., western thermal springs, sulfuric acid genesis: Schoen, R. 06897
Bahamas
Absolute age
C-14, Florida State University list: Martin, J. R. 00832
C-14, ISOTOPES' list: Buckley, James D. 00834
Sedimentary petrology
Andros Island, Superior test well, carbonate diagenesis: Goodell, H. G. 00781
Basins, structural
Colorado
North Park-Middle Park basin: Behrendt, John C. 00775
Batholiths
California
Inyo batholith, monzonite, occurrence: Sylvester, A. G. 00792
Mesozoic, absolute age: Evernden, J. F. 00738
Mesozoic, genesis: Kistler, R. W. 00739
P-T conditions
California, Sierra Nevada, quartz monzonite, crystallization: Wones, David R. 00736
Bentonite
Experimental studies
Exchangeable cations, measurement: Rollins, M. B. 07028
Bibliography
North America
1965: U.S. Geological Survey. 00846
United States
Southeastern, directory of research: Clarke, James W. 00826
Biogeochemical prospecting
Trees-soils
Lead-zinc, upper Mississippi Valley district: Keith, John R. 06877

Biography
Cumings, Edgar Roscoe: Daily, Fay Kenoyer. 06921
Laverdiere, J. W.: Sabourin, Robert. 06924
Messina, Angelina Rose: Brooks, F. Ellis. 00777
Thompson, Warren O.: Curtis, Bruce F. 00778
Boudinage
Occurrence
Vermont, west-central: Voight, Barry. 00873
Theoretical studies
Genesis, model: Voight, Barry. 00873
Brachiopoda
Carboniferous
Nevada-California, Mississippian-Pennsylvanian boundary: Gordon, Mackenzie, Jr. 06810
Brines
Utah
Great Salt Lake, composition, source: Straesser, Manfred. 06993
British Columbia
Absolute age
C-14, UCLA list: Berger, Rainer. 00823
Geochemistry
Geochemical prospecting, copper, molybdenum: Horsnail, R. F. 06845
Grand Forks West Half quadrangle, amphibolite: Petro, V. A. 00815
Sedimentary petrology
Northeastern, Charlie Lake Fm., Boundary Member: Roy, Kenneth James. 00868
Western, Nanaimo Group, sedimentation cycles: Muller, J. E. 00631
Stratigraphy
Cretaceous, Nanaimo Group, western, faunal zones: Muller, J. E. 00631
Paleozoic, Upper, Atlin horst: Monger, J. W. H. 00654
Structural geology
Okanagen Valley, Shuswap terrane, deformation: Ross, John V. 00811
California
Absolute age
C-14, UCLA list: Berger, Rainer. 00823
Klamath Mountains, plutons, metamorphic events, Nevadan orogeny: Lanphere, Marvin A. 00658
Mesozoic batholiths, K-Ar, Rb-Sr: Evernden, J. F. 00738
Sacramento area, Quaternary alluvium, wood, bone: Shlemon, Roy J. 00784
San Andreas fault, displacement: Turner, Donald L. 00798
Earthquakes
April 9, 1968, Borrego Mtn., fault displacements: Clark, M. M. 00701
San Andreas fault, recurrence intervals: Wallace, R. E. 00801
Economic geology
Brines, Searles Lake: Joralemon, Ira B. 06981
Copper, Plumas County, plutons, trace metals, relations: Smith, Arthur R. 00785
Mineral resources, Marin County (western) area: Gluskoter, Harold J. 07068
California
Economic geology
Petroleum and natural gas, Cheviot Hills field: Crowder, Robert E. 00943
Petroleum, Barham Ranch field, possibilities: Wilkinson, Elbert R. 00964
Petroleum, Chico-Martinez field: Weddle, James R. 00944
Petroleum, East Temblor field: Land, P. E. 00961
Petroleum, Five Points field: Hill, F. L. 00962
Petroleum, Hopper Canyon field: Dosch, Murray W. 00935
Petroleum, Long Beach field: Ingram, W. L. 00963
Petroleum, Tejon field, Southeast area: Barnes, J. A. 00965
Petroleum, Temblor Ranch field: Land, P. E. 00966
Petroleum, Wilmington field, offshore part: Szasz, S. E. 00920
Engineering geology
Foundations, Rancho Seco Nuclear Generating Station: Campbell, D. G. 00697
Landslides, Black Mountain quadrangle: Fife, Donald. L. 00689
Landslides, southern, slip-surface geometry: Stout, Martin L. 00789
Materials, properties, California, Oakland East quadrangle: Radbruch, Dorothy H. 00842
Geochemistry
Coso Hot Springs, geochemical prospecting, Hg: Koenig, James B. 00656
Kettleman Hills, paleoenvironments, geochemical analysis: Stanton, Robert J. 00786
Mono Basin, Pleistocene sediments, hydrocarbons: Reed, Walter E. 00783
Salton Sea geothermal system, CO_2 origin: Muffler, L. J. Patrick. 06896
Ultramafic rocks, secondary dolomite, genesis: O'Neil, James R. 00748
Geomorphology
Coast, sand transport by shoaling waves: Cook, David O. 00883
San Pablo Bay, marine terraces, Pleistocene: Williams, C. Thomas. 00807
Geophysical surveys
Channel Islands, gravity, interpretation: Aldrich, John K. 00898
Imperial County, anticline, concretions, infrared: Lintz, Joseph, Jr. 00660
Mount Diablo, gravity: Colburn, Ivan P. 00702
San Bernardino County, geothermal: Birman, Joseph H. 00762
West-central, San Andreas fault zone, gravity: Johnson, J. D. 00667
Hydrogeology
Fremont Valley area, wells and springs, data: U.S. Geological Survey. 00960

California
Hydrogeology
San Bernardino County, geothermal exploration: Birman, Joseph H. 00762
Maps, engineering geology
Oakland East quadrangle: Radbruch, Dorothy H. 00842
Maps, geologic
Marin County (western) area: Gluskoter, Harold J. 07068
Oakland East quadrangle: Radbruch, Dorothy H. 00842
Maps, structure
Barham Ranch oil field, top of "Cherty" zone: Wilkinson, Elbert R. 00964
Cheviot Hills field, top of Miocene "B" zone: Crowder, Robert E. 00943
Chico Martinez oil field: Weddle, James R. 00944
East Temblor oil field, top of Phacoides Sandstone: Land, P. E. 00961
Five Points oil field, top of Domengine sand: Hill, F. L. 00962
Hopper Canyon oil field: Dosch, Murray W. 00935
Long Beach oil field, top of Brown zone: Ingram, W. L. 00963
Tejon oil field, Southeast area, top of lower Fruitvale shale: Barnes, J. A. 00965
Temblor Ranch oil field, top of Phacoides Sandstone: Land, P. E. 00966
Paleoecology
Pliocene–Pleistocene, Kettleman Hills, chemical-faunal analyses: Stanton, Robert J. 00786
Paleontology
Aves, Tertiary, Laguna Hills, fauna: Howard, Hildegarde. 06803
Foraminifera, Pliocene, planktonic, indices cf. Italy: Bandy, Orville L. 00887
Foraminifera, Santa Barbara basin, differential preservation: Berger, Wolfgang H. 00894
Mammalia, Miocene, Kern County, Sharktooth Hill bone bed: Barnes, Lawrence G. 00709
Mammalia, Pleistocene, Rancho La Brea, bison, camel: Miller, Wade E. 06900
Mollusca, Pliocene, Merced(?) Formation, Santa Cruz Mts.: Addicott, W. O. 00711
Nannoplankton, Miocene, Newport Beach, correlation: Wilcoxon, J. A. 00947
Pisces, Miocene, Kern County, sharks: Bishop, Richard C. 00708
Pisces, Miocene, Sharktooth Hill, carangid, dorsal fin: Fierstine, Harry L. 06801
Pisces, Miocene, Temblor–Monterey Formations: Bacskai, Judith A. 00676
Pisces, Pleistocene, Timms Point silt, San Pedro: Fitch, John Edgar. 06804
Radiolaria, Miocene, index of upper, southern: Bandy, Orville L. 00882
Reptilia, Tertiary, Mojave Desert: Whistler, David P. 00804

California
Petrology
Burro Mountain, peridotite: Loney, R. A. 00643
Diablo Range, Franciscan Fm., inverted metamorphic zonation: Blake, M. C., Jr. 00678
Fresno County, Joaquin Ridge, serpentinite flows, structural features: Cowan, Darrel S. 00704
Inyo batholith, monzonite, occurrence: Sylvester, A. G. 00792
Klamath Mountains, Tom Martin ultramafic complex: Barrows, Allan G. 00705
Mono Basin, Cenozoic volcanics: Al-Rawi, Yehya. 00712
Mount Saint Helena ultramafic–mafic complex: Bezore, Stephen P. 00707
Santa Monica Mountains, Miocene volcanics: Blackerby, Bruce A. 00909
Santa Rosa volcanics cf. Jacumba volcanics, norms: Hawkins, James W., Jr. 00670
Sierra Nevada batholith, quartz monzonite, P–T conditions: Wones, David R. 00736
Siskiyou County, metamorphics, gradational sequence: Barrows, Allan G. 00677
Warner Mountains, Cedarville Volcanic Series: Hulbe, C. W. H. 00664
Sedimentary petrology
Mono basin, sediments, accumulation rates, physical properties: Gilbert, C. M. 00690
Sacramento Valley, Meganos gorge fill, compaction: Edmondson, William F. 00914
Santa Cruz Island, Tertiary, lower, paleocurrents, provenance: Merschat, Walter R. 00910
Southern, Miocene, Holocene deep-sea fan valleys, sediments: Normark, W. R. 00642
Ventura basin, Sespe Formation, red beds: McCracken, Willard A. 00881
Stratigraphy
Cretaceous, Budden Canyon Fm., Shasta County, correlation: Murphy, Michael A. 00636
Jurassic–Quaternary, Marin County (western) area: Gluskoter, Harold J. 07068
Mesozoic, Great Valley sequence, Wilbur Springs quadrangle: Rich, Ernest I. 00867
Mesozoic–Tertiary, Garrett Tunnel area: Berkland, James O. 00706
Miocene, biostratigraphy, Santa Cruz Island: Bereskin, S. Robert. 00896
Oligocene–Miocene, biostratigraphy, correlation: Bandy, Orville L. 00892
Paleogene, Channel Islands, northern: Doerner, David. 00895
Quaternary, alluvium, Sacramento area: Shlemon, Roy J. 00784
Tertiary, Cedarville Series, Warner Mts.: Hulbe, C. W. H. 00664
Structural geology
Cenozoic geosyncline, exterior troughs, cf. Sakhalin, Hokkaido, Taiwan: Melankholina, Ye. N. 07026

California
Structural geology
Channel Islands, Anacapa rift, tectonic history: Yeats, Robert S. 00908
Clark Mountain thrust complex, kinematic history: Burchfiel, B. C. 00696
Coast Ranges, Nacimiento fault zone, active movement: Hart, Earl W. 00669
Coast Ranges, northern, Franciscan tectonic units: Suppe, John. 00790
Fault systems, displacements, Borrego Mtn. earthquake: Clark, M. M. 00701
Garrett Tunnel area, Mesozoic–Tertiary sequence, relations: Berkland, James O. 00706
Mesozoic batholiths, genesis: Kistler, R. W. 00739
Mount Diablo, intrusion: Colburn, Ivan P. 00702
Northeastern, lava tubes: Howard, Keith A. 00745
Owens Valley, surface faulting, patterns: Carver, G. A. 00698
San Andreas fault, displacement, absolute dating: Turner, Donald L. 00798
Santa Lucia Range, relations to sea-floor spreading: Page, Ben M. 00632
Santa Lucia Range, Sur Series, folds: Wiebe, Robert A. 00805
Siskiyou County, inverted metamorphic sequence, faults, folds: Barrows, Allan G. 00677
South-central, San Andreas fault, post Middle Miocene movement: Wagner, H. C. 00800
Southwestern, Cenozoic vulcanism, plate tectonics: Hawkins, James W., Jr. 00670
Western, Mesozoic tectonic evolution: Lowe, Donald R. 00646
Wilbur Springs quadrangle: Rich, Ernest I. 00867

Cambrian
Nevada
Ruby Mountains, Precambrian boundary: Kistler, Ronald W. 00655
United States
Great Basin, dolomite, precipitation, sea-floor: Kepper, John C. 00629

Canada
Absolute age
C-14, Geological Survey of Canada list: Lowdon, J. A. 00833
C-14, ISOTOPES' list: Buckley, James D. 00834
C-14, National Physical Laboratory list: Callow, W. J. 00835
C-14, Smitfi onian Institution list: Mielke, James E. 00837
Economic geology
Metals, fahlbands, sulfide schists: Boyle, R. W. 06978
Petroleum, natural gas, general: Hilborn, James D. 07079
Petroleum, natural gas, reserves, potential: Sproule, J. C. 07056

Canada
Economic geology
Petroleum, natural gas, sulfur, reserves, 1967: Connell, Gordon A. 07083
Petroleum, natural gas, western, review: Sproule, J. C. 07080
Petroleum, western, possible reservoirs: Beales, F. W. 00780
Engineering geology
Slope stability, open-pit mines: Brawner, Carroll O. 06867
General
Geological Survey, history, service to oil industry: Belyea, H. R. 07082
Internat. Hydrol. Decade, research contributions: Henoch, Wladyslaw. 06965
Research, review, 1967–68: Natl.Adv. Comm.Research Geol.Sci. 00967
Geomorphology
Meteor craters, arctic and subarctic distribution, age: Sandner, Werner. 06955
Hydrogeology
Research projects, glaciological: Henoch, Wladyslaw. 06965
Sedimentary petrology
Western, evaporite–solution breccia in reef-bank carbonates: Beales, F. W. 00780

Carboniferous
Arkansas
Athens Plateau, stratigraphy: Walthall, Bennie Harrell. 00875
California
Southern, Mississippian–Pennsylvanian boundary: Gordon, Mackenzie, Jr. 06810
Nevada
Southern, Mississippian–Pennsylvanian boundary: Gordon, Mackenzie, Jr. 06810

Caribbean region
Petrology
Bay Islands, igneous and metamorphic rocks: McBirney, Alexander R. 00765
Structural geology
Bay Islands, faults, folds, recent tectonics: McBirney, Alexander R. 00765
Western, tectonic relations, Bonacca Expedition results: McBirney, Alexander R. 00772

Caribbean Sea
Absolute age
Sediments, Th-230—Pa-231: Rona, E. 00978
Geophysical surveys
Bartlett Trough, magnetic, seismic: Banks, Norman G. 00754
Maps, bathymetric
Bartlett Trough, western: Banks, Norman G. 00754
Maps, magnetic
Bartlett Trough, western: Banks, Norman G. 00754
Mineralogy
Holocene sediments, modal analyses: Griffin, John J. 00767

Caribbean Sea
Sedimentary petrology
Sediments, Holocene, petrographic provinces: Griffin, John J. 00767
Structural geology
Bartlett Trough, genesis: Banks, Norman G. 00754
Crustal structure, Rayleigh-wave dispersion: Tarr, Arthur C. 00982

Caves
Indiana
Blue Spring Cave, ground-water flow system conduit: Palmer, Arthur N. 06911
Wyandotte Cave, relation to Blue River: Powell, Richard L. 06910

Cenozoic
California
Tectonics, cf. Sakhalin, Hokkaido, Taiwan: Melankholina, Ye. N. 07026
Central America
Northern, tectonic history, sedimentation: Dengo, Gabriel. 00770
Colorado
Slick Rock district, stratigraphy: Shawe, Daniel R. 07018
Gulf Coastal Plain
Correlation, eastern, cross sections: Maher, John C. 07067
Mammalia
Canidae, evolution: Williams, C. Thomas. 00806
Diprotodontidae, skeletal specializations: Waters, Barbara K. 00802
Nevada
Nevada Test Tuff, thickness, volcanic: Healey, D. L. 06809
Yucca Flats area, alluvial fans: Fernald, Arthur T. 06825
Ostracoda
Campylocytherinae, selected genera, morphology: Plusquellec, Paul Lloyd. 00865
United States
Northwestern, mesa basalt sheet: Walker, G. W. 00936

Central America
Petrology
Northern, pre-Mesozoic rocks: McBirney, Alexander R. 00768
Structural geology
Northern, Central American Mtn. system: McBirney, Alexander R. 00772
Northern, Paleozoic-Cenozoic history: Dengo, Gabriel. 00770
Northern, pre-Mesozoic rocks, structural relations: McBirney, Alexander R. 00768
Volcanology
Major eruptions, 1968: Melson, William G. 00746

Cephalopoda
Ammonoidea
Mesozoic, lower, Nevada, Humboldt Range: Silberling, N. J. 00958

Cephalopoda
Carboniferous
Nevada-California, Mississippian-Pennsylvanian boundary: Gordon, Mackenzie, Jr. 06810
Triassic
Nevada, Thaynes Formation, ammonites: Collinson, James W. 06949

Ceramic materials
Genesis
Flint clay: Keller, W. D. 07041
Kentucky
Western, clay deposits, Eocene: Olive, Wilds W. 00753
Properties
Clays, textbook: Worrall, W. E. 07037
Tennessee
Western, clay deposits, Eocene: Olive, Wilds W. 00753

Changes of level
Alaska
Holocene, Montague Island shoreline, 1964 earthquake: Kirkby, M. J. 00977
Continental margin
Pleistocene, sea-level off California, effect: Dill, Robert F. 00919
Quebec
Quaternary, Lake Saint Jean area: Dionne, Jean-Claude. 06904

Chemical analysis
General
Lake waters, methods, Lakes Erie, Ontario: Chawla, V. K. 07092

Chromium
Abundance
Carbonaceous chondrites: Yates, Ann M. 06999

Clay mineralogy
Areal studies
Indiana, south-central, Pembroke soils: Post, Donald F. 06903
Indiana, south-central, Pembroke soils, quantitative analysis, methods: Post, Donald F. 06919
Kentucky-Tennessee, western, clay deposits: Olive, Wilds W. 00753
Michigan, Keweenaw copper district, alteration: Ruotsala, Albert P. 06961
Montana, southwestern, Morrison and Kootenai Fms.: Suttner, Lee J. 06947
New Jersey, Triassic argillite and shale, weathering: Lodding, William. 07030
New Mexico, Laguna district, Jackpile Sandstone: Nash, J. Thomas. 06991
Washington, Spokane County: Hosterman, J. W. 00825
Wyoming, Big Horn Mts., Gypsum Spring and Sundance Fms.: Furlong, Robert B. 06946
Experimental studies
Bentonites, exchangeable cations: Rollins, M. B. 07028
Cationic diffusion, orientation effects, vermiculite: Lai, T. M. 07015

Clay mineralogy
Experimental studies
Ion exchange, kaolinite clay: Brown, D. A. 07042
Iron analysis by Mossbauer spectroscopy: Taylor, G. L. 06960
Potassium content of clay, X-ray spectrochemical method: Johnson, Leon J. 06959
Soil clays, quantitative analysis, methods: Post, Donald F. 06919
Vermiculite and montmorillonite, aluminum interlayers, ion exchange: Sawhney, B. L. 07027
Mineral data
General and ceramic properties: Worrall, W. E. 07037
Kaolinite, electron microprobe analysis: Weaver, Charles E. 07040

Clays
Genesis
Flint clay: Keller, W. D. 07041
Properties
Ceramic and general, textbook: Worrall, W. E. 07037
Washington
Spokane County, occurrence, genesis, composition: Hosterman, J. W. 00825

Coal
Arkansas
Coal Hill, Hartman, Clarksville quadrangles, potential: Merewether, E. A. 00976
Exploration
Photogeologic techniques, applications: Carmichael, V. W. 06869
Geochemistry
Carbon disulfide extract, spectral studies: Retcofsky, H. L. 07047
X-ray diffraction analysis, interpretation: Ergun, Sabri. 07012
Indiana
Composition, proximate and ultimate analyses: Miller, Louis V. 06917
Kentucky
Graham quadrangle, occurrence: Kehn, Thomas M. 07013
Pennsylvania
Occurrence, production, reserves, review: Edmunds, William E. 07076
Southern Anthracite field, occurrence: Wood, Gordon H., Jr. 00756

Colorado
Absolute age
Needle Mountains, Precambrian chronology: Bickford, M. E. 00986
Unaweep Canyon, Precambrain chronology: Mose, Douglas, G. 00987
Engineering geology
Waste disposal, Rocky Mountain Arsenal well, earthquakes: Colburn, William A. 06836
Geochemistry
Hydrothermal vein deposits, strontium, isotope ratios: Reesman, R. H. 06990

Colorado
Geomorphology
Canon City embayment, southeastern, arroyos: Kane, Henry E. 06907
Geophysical surveys
Aspen-Leadville region, electromagnetic: Alexander, Paul B. 06984
North Park-Middle Park, seismic, gravity, magnetic, interpretation: Behrendt, John C. 00775
Maps, geologic
Black Cabin Gulch quadrangle: Cashion, W. B. 00845
Dillon quadrangle, southwest quarter: Bergendahl, M. H. 00952
Slick Rock district: Shawe, Daniel R. 07018
Maps, structure
North Park-Middle Park area, basement contour: Behrendt, John C. 00775
Paleomagnetism
Eocene, dike rocks, Spanish Peaks: Larson, E. E. 00926
Stratigraphy
Cretaceous-Quaternary, Black Cabin Gulch quadrangle, section: Cashion, W. B. 00845
Dillon quadrangle, southwest quarter, sections: Bergendahl, M. H. 00952
Jurassic, Sundance Formation, north-central: Pipiringos, G. N. 00774
Slick Rock district: Shawe, Daniel R. 07018
Triassic, Chinle Formation, north-central: Pipiringos, G. N. 00774
Structural geology
North Park-Middle Park basin, basement rocks: Behrendt, John C. 00775

Colorado Plateau
Paleomagnetism
Permian, red beds: Farrell, W. E. 00925

Concretions
California
Imperial County, anticline, distribution, infrared study: Lintz, Joseph, Jr. 00660

Connecticut
Maps, magnetic
Putnam quadrangle, airborne: U.S. Geological Survey. 00954
Windsor Locks quadrangle, airborne: U.S. Geological Survey. 00953
Structural geology
Western, folds, field trip: Dieterich, James H. 07011

Conodonts
Silurian
Alaska, southeastern: Ovenshine, A. Thomas. 00635
Triassic
Nevada, Thaynes Formation, Medicine Range: Collinson, James W. 06949

Continental drift
Mechanics
Atlantic Ocean opening, subsialic crustal movement: Dineley, D. L. 07016
Paleomagnetism
North America, Europe, polar wandering curves: Hospers, J. 07064

Continental margin
California
Santa Barbara basin, sedimentation: Soutar, Andrew. 00893
Santa Cruz basin, structure, sediments: Barnes, Peter W. 00913
Southern, Pleistocene sea-level changes, effects: Dill, Robert F. 00919
General
Exploration, application of onshore methods: Osborn, B. C. 00911
Guatemala
Shelf and slope, sediments: Kornicker, Louis S. 00766
Gulf of Saint Lawrence
Appalachian region, Paleozoic tectonics, cf. Europe: Dineley, D. L. 07016
Honduras
Shelf and slope, sediments: Kornicker, Louis S. 00766
Mexico
Western, Rio Balsas submarine canyon: Reimnitz, Erk. 00907
Yucatan shelf, carbonate sediments: Logan, Brian W. 00763
Yucatan shelf, carbonate sediments and reefs: Logan, Brian W. 00771
Yucatan shelf, coral reefs: Logan, Brian W. 00764
Oregon
Southern and central, structure, sedimentation, seismic survey: Kulm, L. D. 00904
Southern shelf, structure, seismic profiling: Bales, William E. 00903
Tertiary biostratigraphy, paleoecology: Fowler, Gerald A. 00891
United States
Eastern, magnetic anomalies, edge effect: Keen, M. J. 00948
Maryland-Delaware-Virginia, submarine canyons, seismic profiles: Uchupi, Elazar. 07060
Northwestern, Pioneer Fracture Zone-Delgada Fan intersection: Winterer, E. L. 07061
Washington
Inner shelf, sediments: Venkatarathnam, K. 00912
Copper
Arizona
Exploration, porphyry deposits, cappings as ore guides: Weiss, Richard Lawrence. 00876
Kalamazoo-San Manuel orebody, alteration zones: Guilbert, J. M. 06839
British Columbia
Exploration, geochemical: Horsnail, R. F. 06845
California
Plumas County, plutons, trace metals, relations: Smith, Arthur R. 00785
New Mexico
Exploration, porphyry deposits, cappings as ore guides: Weiss, Richard Lawrence. 00876
Core
Composition
Chemical equilibrium with mantle: Brett, Robin. 00742
Physical properties
P-wave diffraction, amplitudes near core-shadow boundary: Phinney, Robert A. 00991
Cratering
Field studies
TNT craters, impact craters, similarities: Roddy, D. J. 00724
Cretaceous
Alaska
Northern, flora, Nanushuk, Colville Groups, holarctic extent: Smiley, Charles J. 00779
Atlantic Coastal Plain
New Jersey, Delaware, Maryland, Tertiary boundary: Minard, James P. 00752
British Columbia
Western, Nanaimo Group: Muller, J. E. 00638
California
Shasta County, Budden Canyon Fm., correlation: Murphy, Michael A. 00636
Labrador
Redmond iron deposit, Insecta, new: Rice, H. M. A. 00830
Montana
Southwestern, Kootenai Formation: Suttner, Lee J. 06947
Vertebrata, Judith River Fm.: Sahni, Ashok. 00869
North Carolina
Black Creek Formation, sedimentation: Benson, Paul Harrison, 3d. 00858
North Dakota
Hell Creek Formation, members: Frye, Charles I. 00973
Oregon
Central, conglomerates, plutonic clasts: Taubeneck, William H. 00794
Central, sedimentation: Oles, Keith F. 00633
Southwestern, Myrtle Group, Pelecypoda, zones: Jones, D. L. 0068
Pelecypoda
Mactridae, evolution: Saul, LouElla R. 00813
Quebec
Brome Mountain, alkalic rocks, emplacement sequence: Valiquette, Guy. 06929
South Carolina
Black Creek Formation, sedimentation: Benson, Paul Harrison, 3d. 00858
Texas
Central, Trinity sands: Boone, Peter A. 07066
United States
Western interior, Mollusca, ammonites: Cobban, William A. 00975
West Indies
Bonaire, volcanic rocks, outcrop areas: Zonneveld, J. I. S. 07046

Crinoidea
Ameliacrinus henderi, n.gen. n.sp.
Devonian, Ohio, northwestern, Silica Formation, archaeocrinid: Kesling, Robert V. 06941
Gennaeocrinus chilmanae n.sp.
Devonian, Michigan, southeastern, Silica Formation: Kesling, Robert V. 06939
Logocrinus conicus, n.sp.
Devonian, Michigan, Bell Shale, scytalocrinid: Kesling, Robert V. 06942
Morphology
Proctothylacocrinus, Devonian, Ohio, ontogeny: Kesling, Robert V. 06940
Proctothylacocrinus esseri
Devonian, Ohio, Silica Formation, ontogeny: Kesling, Robert V. 06940
Crust
Experimental studies
Equations of state, periclase: Wang, Chi-yuen. 00992
Equations of state, shock and isothermal: Knopoff, L. 00989
Equations of state, shock reduced to isothermal: Shapiro, J. N. 00990
Heat flow
Sources, vertical distribution: Lachenbruch, Arthur H. 00732
Structure
Atlantic Ocean, Caribbean Sea, Gulf of Mexico, Rayleigh waves: Tarr, Arthur C. 00982
New York–Pennsylvania, earth-tide strain data: Kuo, John T. 00983
United States
Western, structure, seismic data: Claus, Prodehl. 00726
Crystal chemistry
Clinopyroxene
Bonding, isostructural with diopside: Clark, Joan R. 07078
Crystal structure
Chalcopyrite
Derivative of sphalerite: Mariano, Anthony Nick. 00863
Clinopyroxene
Bonding, isostructural with diopside: Clark, Joan R. 07078
Coal
X-ray diffraction patterns: Ergun, Sabri. 07012
Organic materials
X-ray diffraction patterns: Ergun, Sabri. 07012
Senaite
Relation to magnetoplumbite, davidite: Rouse, Roland C. 07005
Cuba
Absolute age
C-14, Smithsonian Institution list: Mielke, James E. 00837
Deformation
Experimental studies
Elastic strain, enstatite–clinoenstatite inversion: Raleigh, C. B. 00734
Deformation
Experimental studies
Fracture, brittle: Brady, B. T. 00969
Fracture, brittle, photoelastic study: Bombolakis, E. G. 07063
Fracture, Westerly granite, high confining pressure: Hsu, K. Jinghwa. 00980
Strength, isotropic rock, thick-walled cylinders: Hoskins, E. R. 00970
Field studies
Instruments, laser extensometer, strain, Earth's surface: Vali, V. 07055
Strength, ice, bubble coalescence: Weertman, J. 07048
Delaware
Stratigraphy
Cretaceous–Tertiary boundary: Minard, James P. 00752
Deltas
Gulf of California
Colorado River, tidal flat sedimentation: Thompson, Robert Wayne. 07021
Devonian
Alaska
Southeastern, clastic wedge, sedimentation: Ovenshine, A. Thomas. 00634
Canada
Western, Fairholme, Presqu'ile, Pine Point formations: Beales, F. W. 00780
Michigan
Alpena County, Crinoidea, Bell Shale: Kesling, Robert V. 06942
Southeastern, Anthozoa, Silica Formation: Stumm, Erwin C. 06902
Southeastern, Crinoidea, Silica Formation, n.sp.: Kesling, Robert V. 06939
Ohio
Northwestern, Anthozoa, Silica Formation: Stumm, Erwin C. 06902
Northwestern, Crinoidea, Silica Formation: Kesling, Robert V. 06940
Northwestern, Crinoidea, Silica Formation: Kesling, Robert V. 06941
Quebec
Gaspe Peninsula, Gaspe Sandstones, Pisces: Pageau, Yvon. 06906
Diagenesis
Carbonate
Dolomitization, Bahamas, Andros Island: Goodell, H. G. 00781
Experimental studies
Biogenic carbonates, Ca, Mg, Sr dissolution: Schroeder, Johannes Herbert. 00870
Carbonates, dissolution, precipitation, mixing of natural waters: Runnells, Donald D. 00812
Sandstone
Petrography: Nash, J. Thomas. 06991
Turbidites, influence on matrix, Quebec: Lajoie, Jean. 06928
Diatoms
Quaternary
Lake Huron, assemblage in core, distribution: Stoermer, E. F. 07085

Dikes
Absolute age
Nevada, Tenabo area: Silberman, M. L. 00809
Colorado
Spanish Peaks, magnetic properties: Larson, E. E. 00926
New Mexico
Shiprock, magnetic properties: Larson, E. E. 00926
Earth
Rotation
Synodic month, variations in geologic past: Miller, Richard H. 00930
Shape
Astrogeodetic geoid map, revision: Fischer, Irene. 07077
Earth tides
Heat source
Tectonic belts, sea-floor spreading: Gruntfest, Irving J. 00733
Observations
New Jersey, Ogdensburg, areal strain: Kuo, John T. 00983
Earthquakes
Alaska
1788, tsunami: Solov'yev, S. E. 07054
March 28, 1964, effects, glaciers: Post, Austin S. 07003
March 28, 1964, effects, Montague Island: Kirkby, M. J. 00977
March 28, 1964, hydrologic effects, Anchorage area: Waller, Roger M. 07038
California
April 9, 1968, Borrego Mtn., fault displacements: Clark, M. M. 00701
San Andreas fault, recurrence intervals: Wallace, R. E. 00801
Effects
Glaciers, Alaska, pre-1964: Field, William O. 07039
Elastic waves
Rayleigh-wave dispersion, North Atlantic, Caribbean Sea, Gulf of Mexico: Tarr, Arthur C. 00982
Surface, excitation, cf. explosion generated: Liebermann, Robert C. 00981
Epicenters
Determination by seismic arrays: Weichert, D. H. 00941
Illinois
November 9, 1968, Harrisburg area, New Madrid Zone: Miller, D. N., Jr. 06971
Magnitude
North America, southwestern, Canadian data, cf. nuclear explosions: Basham, P. W. 00932
Seismic efficiency as a function: King, Chi-Yu. 00933
Mechanism
Colorado, Rocky Mountain Arsenal well: Colburn, William A. 06836
Experimental studies, crack propagation: Peselnick, Louis. 00735
Earthquakes
Prediction
Recent progress, conference, U.S.-Japan program: Oliver, Jack. 00931
United States
1960, western, microtremors, observations: Tanaka, Teiji. 07049
Ecology
Analysis
Faunal mixing, seaweed transportation, significance: Lovenburg, Mervin F. 00645
Lacustrine, eutrophication, mathematical models: Brezonik, Patrick Lee. 07007
Plankton concentration, relation to hydroxy-apatite, Lake Erie: Snow, Phillip D. 07008
Arizona
Arid basin, San Pedro Valley plants, controls: Zimmermann, Robert C. 00974
California
Estuarine, Bodega Bay, microfaunas, distribution: Lipps, Jere H. 00630
Foraminifera
Marine, Alaskan and Siberian continental shelves: Harman, Robert A. 00889
Marine, British Honduras, reef tract and lagoon: Cebulski, Donald E. 00755
Marine, Oregon sublittoral: Boettcher, Richard S. 00888
Oregon
Marine, Foraminifera distribution: Harman, Robert A. 00915
Washington
Marine, Foraminifera distribution: Harman, Robert A. 00915
Marine, inner sublittoral zone, Foraminifera-sediment relations: Echols, Ronald J. 00916
El Salvador
Geochemistry
Ahuachapan fumeroles, geochemical prospecting, Hg: Koenig, James B. 00656
Elastic properties
Inhomogeneous media
Phase and group slowness: Knopoff, Leon. 00988
Rocks
Measurement, automated ultrasonic pulse method: Thill, Richard E. 00937
Electrical methods
Electromagnetic
Instruments, new inductive, test survey: Alexander, Paul B. 06984
Induced potential
Equipment technology: Dickson, G. O. 06838
Electrical properties
Synthetic "rock"
Induced polarization, resistivity, disseminated sulfides: Scott, W. J. 00939
Electrical surveys
Colorado
Aspen-Leadville region, electromagnetic: Alexander, Paul B. 06984
North Dakota
Canal sites, glacial materials, resistivity: Anzman, J. R. 06866

Electron microscopy
Applications
Foraminifera, test structures: Stapleton, Richard P. 00890
Energy sources
Fossil fuels and minerals
Exploration and technology revolution: Travis, Maury M. 06972
Engineering geology
Clays
Anisotropic, undrained strength and pore-water pressures: Duncan, J. M. 07044
Kaolin, energy dissipation, mechanical response: Franklin, Arley Graves. 00851
Dams
Hydrodynamic pressures during earthquakes: Chopra, Anil K. 00849
Earthquakes
Dams, hydrodynamic pressures: Chopra, Anil K. 00849
Probabilistic models for seismic force design: Esteva, Luis. 00850
United States, microtremors, aseismic design: Tanaka, Teiji. 07049
Experimental studies
Structure–foundation systems, seismic response: Perelman, David S. 00880
Foundations
California, Rancho Seco Nuclear Generating Station: Campbell, D. G. 00697
Land use
Strip mined areas, glaciated vs. nonglaciated, Indiana: Guernsey, Lee. 06918
Landslides
California, Black Mountain quadrangle: Fife, Donald. L. 00689
California, southern, slip-surface geometry: Stout, Martin L. 00789
Ontario, Toronto area, Don Valley Parkway: Matich, M. A. J. 06962
Materials, properties
California, Oakland East quadrangle: Radbruch, Dorothy H. 00842
Granite, marble, microstructural techniques: Willard, R. J. 00968
In-situ rock, field and laboratory studies, classification system: Merritt, Andrew Hutcheon. 00852
In-situ rock, laboratory and field study: Coon, Richard Floyd. 00879
Volcanic rocks, Nevada Test Site: Carroll, Roderick D. 06819
Methods
Density sampling, alluvium, evaluation: Prokopovich, Nikola P. 00818
Nuclear explosions
Mississippi, Tatum salt dome: Summers, George E. 06888
Nevada, ground-water contamination: Essington, Edward H. 06797
Nevada, southern, test site, geologic results, general: Eckel, Edwin B. 06821
Underground testing, site appraisal, Nevada: Houser, F. N. 06823
Engineering geology
Rock mechanics
Applications, longwall roof control problems: Holland, C. T. 06843
Brittle failure, experimental study: Brady, B. T. 00969
Coal mining, electric log applications: Bond, L. O. 06829
Compressive strength studies, rock pillars: Babcock, C. O. 06827
Experimental study, thick-walled hollow cylinders: Hoskins, E. R. 00970
Microstructural techniques: Willard, R. J. 00968
Mine roof stability, effect of shale: Scott, James J. 06857
Mississippi, Tatum salt dome, stability: Nair, Keshavan. 06886
Nevada, Ely area, Kimbley pit, model study: Blake, Wilson. 07010
Quarries, problem areas, geophysical detection: Lutzen, E. E. 06847
Scanning electron microscopy, application: Willard, R. J. 06861
Stress-relief studies, boreholes: Barla, G. B. 06828
Underground inhomogeneities, stress distribution, model: Pulpan, Hans. 00853
Shorelines
Ontario, Lake Erie, Port Bruce area, bluff erosion: Quigley, R. M. 07090
Pennsylvania, Lake Erie, stabilization: Berg, Dennis W. 07009
Slope stability
Canada, open-pit mines: Brawner, Carroll O. 06867
Microseismic technique: Wisecarver, D. W. 06862
Nevada, Ely area, Kimbley pit, model study: Blake, Wilson. 07010
Open-pit mines, dams, canals, review: Lutton, Richard. 06878
Soils
Strength anisotropy, Mohr-Coulomb theory: Baker, Wallace Hayward. 00878
Strip mining
Hydrologic effects: Cederstrom, D. J. 06835
Submarine installations
Acoustical surveying systems, advantages: Palmer, H. D. 06882
Underground excavation
Granitic rock, stability index, Nevada Test Site: Ege, John R. 06812
Waste disposal
Coal mine waters, Pennsylvania: Stefanko, Robert. 06858
Colorado, Rocky Mountain Arsenal well: Colburn, William A. 06836
Ground-water systems, dissolved chemicals, transport: Holly, Donald E. 06811
Radioactive, hydraulic fracturing method: deLaguna, Wallace. 06837
Radioactive, solidified material, salt mines: McClain, William C. 06850

Engineering geology
Waste disposal
South Carolina, Savannah River Plant, geologic factors: Reichert, S. O. 06887
Erosion
Beaches
Ontario, Port Bruce area, Lake Erie bluffs, stability tests: Quigley, R. M. 07090
Estuaries
Sedimentation
Gulf of California, Colorado River delta: Thompson, Robert Wayne. 07021
Evolution
Mammalia
Canidae, Pliocene–Pleistocene: Williams, C. Thomas. 00806
Equidae, Oligocene–Holocene, Manus osteology: Sondaar, P. Y. 07006
Hyracodon, dentition: Hanson, C. Bruce. 06997
Pelecypoda
Mactridae, Cretaceous: Saul, LouElla R. 00813
Explosion phenomena
Experimental studies
Surface wave, excitation, cf. earthquake generated: Liebermann, Robert C. 00981
Products
Shatter cones, TNT cratering, Utah, Cedar City: Roddy, D. J. 00725
Faults
Experimental studies
Mechanics, overthrusting: Hsu, K. Jinghwa. 00980
General
California, Owens Valley, surface, patterns: Carver, G. A. 00698
Nevada, Fish Creek Mts. volcanic center: McKee, Edwin H. 00649
Nevada, Yucca Flat area: Hinrichs, E. Neal. 06794
Pennsylvania, Southern Anthracite region: Wood, Gordon H., Jr. 00756
Geometry
Tennessee, Saltville fault: Smith, James William. 00871
Mechanism
Nevada, Yucca Flat, displacement, nuclear explosion trigger: Dickey, D. D. 06814
Normal
Tensional spreading vs. tectonic denudation: Cloos, Ernst. 00758
Overthrust
California, Clark Mountain complex, kinematic history: Burchfiel, B. C. 00696
California, Coast Ranges, northern, Franciscan units: Suppe, John. 00790
California, Siskiyou County, inverted metamorphic sequence: Barrows, Allan G. 00677
California, Wilbur Springs quadrangle: Rich, Ernest I. 00867
Nevada, Snake Mountains, northern: Gardner, Douglas Hanson. 00861
Faults
Overthrust
Nevada Test Site region, major system, outliers: Barnes, Harley. 06793
Oregon, southwestern, Dothan and Rogue Fms., contact: Hotz, Preston E. 00663
Quebec, southwestern, Sillery klippe: Saint-Julien, Pierre. 06934
Vermont, west-central, Sudbury fault: Voight, Barry. 00873
Washington, Whatcom–Skagit Counties, Cretaceous: Miller, Gerald M. 00651
Rift valleys
California, Channel Islands, Anacapa rift: Yeats, Robert S. 00908
Strike-slip
California, San Andreas fault, displacement, age: Turner, Donald L. 00798
California, San Andreas fault, post Middle Miocene movement: Wagner, H. C. 00800
California, San Andreas, gravity survey: Johnson, J. D. 00667
Systems
California, displacements, Borrego Mtn. earthquake: Clark, M. M. 00701
California, Nacimiento zone, active movement: Hart, Earl W. 00669
Nevada, southern, age: Ekren, E. B. 06795
Nevada, southern, Las Vegas Valley shear zone, others: Ekren, E. B. 06822
Nevada, Timber Mountain, caldera dome: Carr, W. J. 06817
Trends, mineralization: Stokes, William Lee. 06985
Florida
Absolute age
Central, crystalline basement rocks: Bass, Manuel N. 00769
Hydrogeology
Ground-water resources, boulder zone: Vernon, R. O. 06859
Petrology
Central, crystalline basement rocks: Bass, Manuel N. 00769
Sedimentary petrology
Ona and Leon fine sands, aggregation of mineral and organic matter: Volk, G. M. 06963
Western, Magnolia and Greenville soils, genesis, morphology: Caldwell, R. E. 06951
Western, Marlboro and Faceville soils, genesis, morphology: Dantzman, C. L. 06964
Weathering
Okeechobee County, soil genesis, deep profile studies: Fiskell, J. G. A. 06950
Western, Magnolia and Greenville soils, genesis: Caldwell, R. E. 06951
Western, Marlboro and Faceville soils, genesis: Dantzman, C. L. 06964
Fluid inclusions
Associations
COFFI, founding: Roedder, Edwin. 06977
Leakage
Experimental studies: Roedder, Edwin. 06943

Fluorspar
Illinois
Cave-In-Rock district, exploration: Hughes, T. H. 06874
Southern, exploration, geochemical: Keighin, Charles W. 06876
Folds
Anticlinal
Wyoming, Big Horn County, Sheep Mtn. anticline: Johnson, Gary D. 06982
Anticlinoria
California, Coast Ranges, northern, Franciscan units: Suppe, John. 00790
General
California, Santa Lucia Range, Sur Series: Wiebe, Robert A. 00805
Geometry
North Carolina, Stokes County, Hanging Rock area: Centini, Barry Austin. 00860
Major
Pennsylvania, Southern Anthracite field: Wood, Gordon H., Jr. 00756
Mechanism
Connecticut, western: Dieterich, James H. 07011
Minor
Nevada, Yucca Flat area: Hinrichs, E. Neal. 06794
Recumbent
British Columbia, Okanagen Valley, Shuswap terrane: Ross, John V. 00811
Foliation
Ignimbrite
Genesis by compaction: Ragan, Donal M. 00819
Metamorphic rocks
North Carolina, Stokes County, Hanging Rock area: Centini, Barry Austin. 00860
Foraminifera
Cenozoic
Gulf Coastal Plain, eastern, assemblages: Maher, John C. 07067
Glabratella ornatissima
Plastogamy, mechanism, significance: Lipps, Jere H. 00662
Mesozoic
Gulf Coastal Plain, eastern, assemblages: Maher, John C. 07067
Mississippian
Newfoundland, Codroy Group, St. Georges Bay area: Mamet, B. L. 06935
Morphology
Tests, benthic calcareous, electron microscopy: Stapleton, Richard P. 00890
Planktonic
Paleogene, lineage genera classification: Steineck, P. Lewis. 00886
Quaternary
California, Santa Barbara basin, preservation: Berger, Wolfgang H. 00894
Tertiary
California, Pliocene, planktonic indices, cf. Italy: Bandy, Orville L. 00887
Foraminifera
Tertiary
Continental margin, Oregon, biostratigraphy, paleoecology: Fowler, Gerald A. 00891
Fractures
Experimental studies
Brittle, initial stages in compression: Bombolakis, E. G. 07063
Crack propagation, uniaxial compressive stress: Peselnick, Louis. 00735
Patterns
Arizona, southern, ore guide: Wertz, J. B. 06860
Nevada, Yucca Flat, explosion-produced: Barosh, Patrick J. 06813
Zones
Pacific Ocean, south of Aleutian trench, magnetic anomalies: Grim, Paul J. 00924
Fumeroles
El Salvador
Ahuachapan, mercury, occurrence: Koenig, James B. 00656
Gas, natural
Arkansas
Coal Hill, Hartman, Clarksville quadrangles, potential: Merewether, E. A. 00976
California
Cheviot Hills field, occurrence: Crowder, Robert E. 00943
Canada
Reserves and potential: Sproule, J. C. 07056
Resources, general: Hilborn, James D. 07079
Western, exploration history: Sproule, J. C. 07080
Western, reserves, 1967: Connell, Gordon A. 07083
Illinois
Map of fields, 1968: Meents, Wayne F. 06799
Kentucky
Graham quadrangle, occurrence: Kehn, Thomas M. 07013
Wyoming
Casper area, Iron Creek field, occurrence, production: Dahill, Murray P. 06983
Geochemical prospecting
Heavy metals
Stream sediments, anomaly variations, origin: Rose, A. W. 06854
Interpretation
Trace-element distributions, igneous rocks: Neuerburg, G. J. 06851
Mercury
Soil gas, air, experimental: McCarthy, J. H. 06849
Water
Zinc, Wisconsin: DeGeoffroy, J. 06944
Geochemical surveys
Illinois
Southern, fluorspar, trace-element distribution: Keighin, Charles W. 06876
Indiana
Strip mined areas, spoil banks, pH, relation to glacial till: Guernsey, Lee. 06918

Geochemical surveys
Oregon
Sixes River, gold, size-grade relations: Boggs, Sam, Jr. 00695
South Dakota
Eastern, ground-water pH, field and laboratory determinations, differences: Lufkin, Nat. 06995
Tennessee
Eastern, lead, zinc: Carpenter, R. H. 06834
Wisconsin
Southwestern, zinc: DeGeoffroy, J. 06944
Geochemistry
Abundance of elements
Gold, oceans: Rosenbaum, J. B. 06855
Biogenic carbonates
Holocene, Ca, Mg, Sr dissolution: Schroeder, Johannes Herbert. 00870
Carbonate minerals
Interaction with organic compounds: Suess, Erwin. 00872
Experimental studies
Sphalerite, synthesis, aqueous solutions: Chernyshev, L. V. 06979
Fluid inclusions
Leakage, experimental studies: Roedder, Edwin. 06943
Graphite schists
Metals, sulfides: Boyle, R. W. 06978
Ground water
Multiple aquifers, drilling wells, field monitoring: Rawson, Jack. 07033
Instruments
Field kit, water alkalinity: Kunkler, J. L. 07032
Manganese
Ore deposits, general: Roy, Supriya. 06986
Processes
Diffusion, fluid inclusions: Roedder, Edwin. 06943
Ion exchange, bentonite, cations: Rollins, M. B. 07028
Ion exchange, clay minerals, aluminum interlayers: Sawhney, B. L. 07027
Ion exchange, kaolinite clay: Brown, D. A. 07042
Ion exchange, vermiculite, cations: Lai, T. M. 07015
Volcanics
Trace elements, tephrachronology: Goles, G. G. 00683
Water
Alkalinity determination, field kit: Kunkler, J. L. 07032
Geochronology
Fatty acids
Algae: Das, Salil K. 07045
Geodesy
Figure of Earth
Astrogeodetic geoid map, revision, equatorial radius: Fischer, Irene. 07077
Geologic exploration
Methods
Archeology, Alaska: Hamilton, Thomas D. 00686
Geologic thermometry
Methods
Fluid inclusions, leakage: Roedder, Edwin. 06943
System Zn-Fe-S: Campbell, F. A. 06975
System Zn-Fe-S: Chernyshev, L. V. 06979
System Zn-Fe-S: Einaudi, Marco T. 06976
Geological exploration
Marine
Manned submersible, Star 2, Lake michigan: Somers, Lee H. 07095
Methods
Remote sensing, application to open pits: Reeves, R. G. 06883
Mine mapping
Utah, Bingham Canyon, open pit: Smith, W. H. 06885
Geomorphology
Environment
Arid basin, Arizona, San Pedro Valley, plant ecology, controls: Zimmermann, Robert C. 00974
Coastal plain, Gulf of California, Colorado River delta, tidal flat: Thompson, Robert Wayne. 07021
Fluvial features
Alluvial fans, coalescing types, Nevada, Yucca Flats area: Fernald, Arthur T. 06825
Arroyos, Colorado, Canon City embayment, southeastern: Kane, Henry E. 06907
Clear Creek drainage, Wyoming, Buffalo area, relict drainage: Nelson, Robert S. 06948
Flood scour, placers: Krook, Leendert. 06980
Terraces, Indiana, Ohio Valley, south-central: Straw, W. Thomas. 06909
Valleys, amphitheater-headed, Hawaii, evolution: Abbott, Agatin T. 00710
General
Encyclopedia: Fairbridge, Rhodes W. 07022
Glacial features
Drift, Alaska, Brooks Range, history: Hamilton, Thomas D. 00687
General, Indiana, east-central: Wayne, William J. 06915
Grooves, erosion surfaces, Washington, Fidalgo Island: Danner, Wilbert R. 00691
Moraines, Indiana, Tinley Moraine: Schneider, Allan F. 06914
Moraines, Wisconsin, eastern, Kettle Interlobate Moraine: Black, Robert F. 00827
Quebec, New York, chattermarks: Laverdiere, Camille. 07002
Quebec, Saguenay County, fluvioglacial deposit: Sauve, Pierre. 06931
Till, Washington, Mount Adams: Hopkins, Kenneth D. 00628
Valleys, Washington, Skagit Valley, anomalous cross section: Weis, Paul L. 00803
Landform evolution
Missouri, Saint Francis River basin, lithologic influences: Hosking, Peter Leighton. 00855

Geomorphology
Landform evolution
New York City region, Precambrian–Holocene: Schuberth, Christopher J. 06968
Submarine canyons, dendritic pattern: Reimnitz, Erk. 00907
West Indies, Montserrat, southern: Rea, W. J. 06953
Marine features
Deep-sea fan valleys, off California, Holocene, Miocene: Normark, W. R. 00642
Submarine canyon, Rio Balsas off Mexico: Reimnitz, Erk. 00907
Terraces, California, San Pablo Bay: Williams, C. Thomas. 00807
Terraces, Oregon, Cape Blanco area, correlation: Janda, Richard J. 00665
Transport, near shore, computer simulation: Bonham-Carter, Graeme F. 00885
Transport, shoaling waves, sand: Cook, David O. 00883
Mass movements
Landslides, mud-flow types, Quebec: Chagnon, Jean-Y. 06933
Methods
Terrain analysis, automatic data processing: Turner, A. Keith. 06913
Quantitative geomorphology
Terrain analysis, automatic data processing: Turner, A. Keith. 06913
Shore features
Earthquake effects, 1964, Alaska, Montague Island: Kirkby, M. J. 00977
Solution features
Karst, Missouri, Ozark Mts., Hurricane Creek basin: Aley, Thomas. 07052
Textbooks
Encyclopedia: Fairbridge, Rhodes W. 07022
Geophysical methods
Applications
Subsurface surveying: Malott, D. F. 06879
Geophysical surveys
Colorado
North Park–Middle Park basin, basement structure: Behrendt, John C. 00775
Pacific Ocean
Bering Sea, review: Stone, D. B. 07062
Geothermal energy
California
Salton Sea geothermal system, CO_2 origin: Muffler, L. J. Patrick. 06896
Geothermal surveys
California
Coso Hot Springs, mercury: Koenig, James B. 00656
El Salvador
Ahuachapan fumeroles, mercury: Koenig, James B. 00656
Glaciation
Causes
Summer insolation variations at high northern latitudes: Kemp, W. C. 00940
Glaciation
Deglaciation
Ice-front stagnation, Quebec: Sauve, Pierre. 06931
Glaciers
Alaska
Earthquake effects, March 1964: Post, Austin S. 07003
General, earthquake effects, pre-1964: Field, William O. 07039
Experimental studies
Ice deformation, history, bubble coalescence: Weertman, J. 07048
Greenland
Central icecap, upper layers, physical properties, thickness: Brockamp, B. 06956
Ice
Deformation, history, bubble coalescence: Weertman, J. 07048
Physical properties, P-wave velocity distribution: Ruter, H. 06957
Glossaries
Geomorphology
Encyclopedia: Fairbridge, Rhodes W. 07022
Gold
Abundance
Oceans: Rosenbaum, J. B. 06855
Genesis
Placers, flood scour: Krook, Leendert. 06980
Nevada
Gold Acres open-pit mine, structural controls: Wrucke, Chester T. 00808
Nellis Air Force range, occurrence: Ekren, E. B. 06822
North Carolina
Slate Belt, genesis: Worthington, J. E. 06863
Oregon
Sixes River, size-grade relations: Boggs, Sam, Jr. 00695
South Dakota
Trojan area, Bald Mtn. mine tailings, analysis: Fredlund, Daniel A. 06994
Graptolithina
Quebec
Ordovician, Middle, Gaspe north shore: Riva, John. 06937
Gravity methods
Applications
Intrusive bodies, shape, use of anomalies: Bonini, W. E. 06830
Interpretation
Equivalent source technique: Dampney, C. N. G. 00946
Gravity surveys
California
Channel Islands, interpretation: Aldrich, John K. 00898
Mount Diablo: Colburn, Ivan P. 00702
West-central, San Andreas fault zone: Johnson, J. D. 00667
Minnesota
Duluth complex region: Ikola, R. J. 06875
Nevada
Nevada Test Site and vicinity: Healey, D. L. 06809

Great Lakes region
Areal geology
Lake Michigan, subsurface, topography, bedrock, sediments: Somers, Lee H. 07086
General
Geological exploration, manned submersible, Lake Michigan: Somers, Lee H. 07095
Geochemistry
Lake Erie, hydroxy-apatite saturation vs. plankton: Snow, Phillip D. 07008
Lake Erie, sediments, ferrous iron analysis: Ross, Curtis. 07093
Lake Erie, water, chemical composition: Weiler, R. R. 07094
Lakes Erie, Ontario, sediments, chlorophyll degradation products: Kemp, A. L. W. 07089
Lakes Erie, Ontario, water analysis, methods: Chawla, V. K. 07092
Geophysical surveys
Lake Ontario, Niagara area, sediments, transit sonar: Donato, R. J. 07087
Paleontology
Diatoms, Quaternary, Lake Huron, core assemblage: Stoermer, E. F. 07085
Sedimentary petrology
Lake Michigan, southwestern, bottom sediments: Somers, Lee H. 07091
Greenland
Geophysical surveys
Central icecap, upper layers, physical properties, seismic: Brockamp, B. 06956
Glacial geology
Central icecap, upper layers, properties, thickness: Brockamp, B. 06956
Tuto ice tunnel, polycrystalline ice, P-waves, velocity distribution: Ruter, H. 06957
Petrology
Kialineq area, igneous rocks, intrusive: Brown, P. E. 06952
Ground water
Alabama
Resources, Conecuh County: Reed, P. C. 07071
Resources, Covington County: Turner, J. D. 06966
Resources, Crenshaw County: McWilliams, R. G. 07074
Resources, Dale County: Newton, J. G. 07073
Resources, Henry County: Newton, J. G. 07075
Resources, Pike County: Shamburger, V. M., Jr. 07070
Alaska
Earthquake effects, March 1964, Anchorage area: Waller, Roger M. 07038
Arizona
Resources, Navajo and Hopi Indian Reservations: Cooley, M. E. 00959
California
Exploration, San Bernardino County, geothermal: Birman, Joseph H. 00762
Ground water
California
Wells and springs, Fremont Valley area, data: U.S. Geological Survey. 00960
Florida
Resources, boulder zone: Vernon, R. O. 06859
Indiana
Lost River basin, subterranean drainage routes: Murdock, Stanley H. 06912
Movement, Mitchell Plain, Blue Spring Cave conduit: Palmer, Arthur N. 06911
Massachusetts
Resources, Assabet River basin: Pollock, S. J. 00757
Resources, Tenmile and Taunton River basins, northern: Williams, John R. 07035
Michigan
Resources, Gogebic County, wells and springs, quality: Doonan, C. J. 06989
Minnesota
Resources, north-central, Mississippi headwaters watershed: Oakes, E. L. 07058
Missouri
Recharge, Ozark Mountains, Hurricane Creek basin, karst: Aley, Thomas. 07052
Nebraska
Resources, Antelope County: Souders, V. L. 07053
Nevada
Movement, south-central, structural control: Winograd, Isaac J. 06824
North Dakota
Resources, Cass County, glacial drift aquifers: Klausing, Robert L. 07043
South Dakota
Composition, eastern, pH, field and laboratory determination, differences: Lufkin, Nat. 06995
Model study, southeastern, Choteau aquifer: Kume, Jack. 06998
Recharge, Big Sioux aquifer system, stream discharge: Ackroyd, Earl A. 06996
Recharge, Black Hills, east side, losses from streams to caverns: Gries, John Paul. 06890
Resources, Sioux Falls area, new aquifer: Vaughan, Kenneth D. 06892
Resources, southeastern, Choteau aquifer, analog model and analyzer study: Kume, Jack. 06998
United States
Resources, mineralized, conterminous: Feth, J. H. 00718
Resources, northeastern, effects of 1961-67 drought: Barksdale, Henry C. 06967
Wisconsin
Geochemical prospecting, zinc: DeGeoffroy, J. 06944
Guatamala
Sedimentary petrology
Continental shelf, bottom sediments: Kornicker, Louis S. 00766
Gulf Coastal Plain
Paleontology
Foraminifera, Mesozoic-Cenozoic, eastern, assemblages: Maher, John C. 07067

Gulf Coastal Plain
Paleontology
Ostracoda, Cenozoic, selected genera, morphology: Plusquellec, Paul Lloyd. 00865
Stratigraphy
Mesozoic–Cenozoic, eastern, correlation, cross sections: Maher, John C. 07067
Gulf of California
Geomorphology
Colorado River delta, tidal flat, depositional regression, beach ridges: Thompson, Robert Wayne. 07021
Sedimentary petrology
Colorado River delta, tidal flat sedimentation: Thompson, Robert Wayne. 07021
Gulf of Mexico
Hydrogeology
Northern, aquifer systems, geochemical hydrodynamics: Jones, Paul H. 06894
Structural geology
Crustal structure, Rayleigh-wave dispersion: Tarr, Arthur C. 00982
Gulf of Saint Lawrence
Structural geology
Appalachian region, Paleozoic tectonics, cf. Europe, continental drift: Dineley, D. L. 07016
Hawaii
Absolute age
C-14, U.S. Geological Survey list: Marsters, Beverly. 00838
Geomorphology
Amphitheater-headed valleys, evolution: Abbott, Agatin T. 00710
Paleomagnetism
Quaternary, Mokuaweoweo caldera, lava, secular variations: Doell, Richard R. 00714
Petrology
Honolulu Volcanic Series, magmas, xenoliths, zoning: Jackson, Everett D. 00747
Volcanology
Alae Lava Lake, lava, density: Peck, Dallas L. 00743
Kilauea, tilt, 1965–68: Fiske, Richard S. 00713
Major eruptions, 1968: Melson, Willam G. 00746
Heat flow
Conductivity
Basalt, Hawaii: Robertson, Eugene C. 00744
Geothermal gradient
Ground-water effect, exploration tool: Birman, Joseph H. 00762
Heat sources
Crust, vertical distribution: Lachenbruch, Arthur H. 00732
Earth tides: Gruntfest, Irving J. 00733
Wyoming
Yellowstone Park, infrared data, calibration: White, Donald E. 00749
History
Canada Geological Survey
Service to oil industry: Belyea, H. R. 07082
Oil exploration
Canada, western: Sproule, J. C. 07080
Honduras
Sedimentary petrology
Continental shelf, bottom sediments: Kornicker, Louis S. 00766
Hydrogen
Isotopes
Tritium, international geophysical research project: Suess, Hans E. 00929
Hydrogeology
Aquifer properties
Evolution, numerical technique: Pinder, George Francis. 00877
Automatic data processing
Aquifer evolution, Nova Scotia: Pinder, George Francis. 00877
Saline-water data, New Mexico, Texas, Delaware basin: Hiss, William L. 00719
Experimental studies
Ground-water recharge and discharge, mechanism: Freeze, R. Allan. 00761
Exploration methods
Geophysical logging: Johnson, A. I. 07034
Geothermal exploration: Birman, Joseph H. 00762
Saline aquifers, evaluation, electric logs, Louisiana: Turcan, A. N., Jr. 00721
U.S. Geol. Survey, techniques, 1966–67: Chase, Edith Becker. 07031
Geochemistry
Alkalinity determination, field kit: Kunkler, J. L. 07032
Multiple aquifers, drilling wells, field monitoring: Rawson, Jack. 07033
Ground-water contamination
Nuclear explosions, Nevada: Essington, Edward H. 06797
Transport of dissolved chemicals: Holly, Donald E. 06811
Ground-water movement
Structural control, Nevada, south-central: Winograd, Isaac J. 06824
Ground-water storage
Saline aquifers: Moulder, E. A. 00720
Hydrodynamics
Geochemical, aquifer properties, Gulf of Mexico: Jones, Paul H. 06894
Mathematical models
Ground-water recharge and discharge, mechanism: Freeze, R. Allan. 00761
Methods
Glaciological research, Canada, Internat. Hydrol.: Henoch, Wladyslaw. 06965
Resource development
Computer models, feasibility, Nova Scotia, alluvial aquifer: Trescott, Peter C. 00722
Saline ground-water problem: Kohout, F. A. 00717
Strip mining effects: Cederstrom, D. J. 06835
System evaluation, uncertain factors, relative impact: James, Ivan C. 00715

Hydrogeology
Resource development
Water supplies, mineral industry, water control: Harshbarger, J. W. 06840
Hydrothermal alteration
Michigan
Keweenaw copper district: Ruotsala, Albert P. 06961
Wyoming
Yellowstone Park drill hole Y-1, minerals: Honda, S. 00750
Idaho
Maps, geologic
Mica-Manito-Saxby area, pre-Palouse geology: Hosterman, J. W. 00825
Soda Springs quadrangle: Armstrong, Frank C. 00951
Petrology
Salmon River Mountains, rapakivi granite: Goodspeed, G. E. 00684
Stratigraphy
Cambrian-Quaternary, Soda Springs quadrangle, sections: Armstrong, Frank C. 00951
Igneous rocks
Alkalic
Petrology, Quebec, Brome Complex: Valiquette, Guy. 06929
Andesite
Petrology, Lesser Antilles: Baker, P. E. 07014
Anorthosite
Petrology, Quebec, Shawinigan Complex, differentiation: Martignole, Jacques. 06927
Basalt
General description, Oregon, Washington: Holmgren, Dennis A. 00675
Petrology, Oregon, Cascade Range, welded tuff: Taylor, Edward M. 00795
Petrology, Pacific Ocean, northeastern, seamount: Nayudu, Y. R. 00638
Petrology, South Sandwich Islands cf. Lesser Antilles: Baker, P. E. 07014
Thermal conductivity, Hawai: Robertson, Eugene C. 00744
Composition
Nevada, Nye County, Miocene: Anderson, R. Ernest. 06807
Diabase
Petrology, composition, North Carolina Piedmont: Ragland, Paul C. 07069
Differentiation
Oregon, Coast Range, sill: MacLeod, Norman S. 00647
Radioactivity effects, correlation: Tilling, Robert I. 00731
Gabbro
Petrology, Greenland, Kialineq area: Brown, P. E. 06952
General
Absolute age, Nevada, Tenabo area: Silberman, M. L. 00809
Petrology, Oregon, plutonic clasts in conglomerate: Taubeneck, William H. 00794
Igneous rocks
Granite
Petrology, Greenland, Kialinq area: Brown, P. E. 06952
Physical properties, frictional characteristics, high confining pressure: Hsu, K. Jinghwa. 00980
Physical properties, microstructural techniques: Willard, R. J. 00968
Textures, rapakivi, Idaho, Snake River Mts.: Goodspeed, G. E. 00684
Granitic
Absolute age, California, Mesozoic batholiths: Evernden, J. F. 00738
Engineering properties, Nevada, Yucca Flat: Ege, John R. 06812
Petrology, Oregon, clasts in conglomerate: Taubeneck, William H. 00793
Granophyre
Differentiation, Northwest Territories, Muskox intrusion: Pouliot, Gaston. 06930
Ignimbrite
Absolute age, Nevada, Fish Creek Mts. volcanics: McKee, Edwin H. 00649
Foliation, genesis by compaction: Ragan, Donal M. 00819
Genesis, mechanism, form and distribution of deposits: Noble, Donald C. 00640
Petrology, Oregon, Cascade Range, basaltic: Taylor, Edward M. 00795
Mafic
Petrology, California, Mount St. Helena complex: Bezore, Stephen P. 00707
Monzonite
Petrology, California, Inyo batholith: Sylvester, A. G. 00792
Peridotite
Petrology, California, Burro Mtn.: Loney, R. A. 00643
Quartz monzonite
Crystallization depth, California, Sierra Nevada batholith: Wones, David R. 00736
Syenite
Petrology, Greenland, Kialineq area: Brown, P. E. 06952
Ultramafic
Petrology, California, Mount St. Helena complex: Bezore, Stephen P. 00707
Petrology, California, Tom Martin complex: Barrows, Allan G. 00705
Volcanics
Absolute age, geochemistry, Utah, Bull Valley district: Blank, H. Richard. 00679
Absolute age, Maine, Penobscot Bay: Brookins, D. G. 00741
Absolute age, Precambrian, United States, southeastern: Rankin, D. W. 00740
General description, Arizona, Black Mesa caldera: Sheridan, Michael F. 00814
General description, California, Cedarville Series: Hulbe, C. W. H. 00664
General description, Miocene, California, Santa Monica Mts.: Blackerby, Bruce A. 00909

Igneous rocks
Volcanics
General description, Nevada, Humboldt County: Noble, Donald C. 00641
General description, Nevada, southern: Ekren, E. B. 06822
General description, Washington, Goats Rocks volcano: Ellingson, Jack A. 00693
Geochemistry, Pb, Sr isotopes, Wyoming: Peterman, Zell E. 00821
Geochemistry, trace elements, tephrachronology: Goles, G. G. 00683
Magnetic properties, Nevada Test Site, Tertiary units: Bath, Gordon D. 06806
Petrology, Alaska, Nunivak Island: Hoare, J. M. 00672
Petrology, California, Baja California, Cenozoic: Hawkins, James W., Jr. 00670
Petrology, California, Nevada, Mono Basin: Al-Rawi, Yehya. 00712
Petrology, Hawaii, Honolulu Volcanic Series: Jackson, Everett D. 00747
Petrology, Nevada, Goldfield Tonopah region: Vitaliano, Charles J. 00799
Petrology, Nevada, Nye County, Silent Canyon caldera: Noble, Donald C. 06808
Physical properties, Nevada Test Site, Cenozoic series: Healey, D. L. 06809

Illinois
Earthquakes
November 9, 1968, Harrisburg area, New Madrid Zone: Miller, D. N., Jr. 06971
Geochemistry
Cave-In-Rock district, geochemical prospecting: Hughes, T. H. 06874
Fluorite district, trace-element distribution: Heyl, A. V. 06872
Southern, geochemical prospecting, fluorspar: Keighin, Charles W. 06876
Maps, oil and gas
1968 information: Meents, Wayne F. 06799
Paleontology
Anthozoa, Silurian, Niagaran dolomite, Chicago area: Stumm, Erwin C. 06898

Indiana
Areal geology
Washington County: Sunderman, Jack A. 07025
Economic geology
Coal, composition, proximate and ultimate analyses: Miller, Louis V. 06917
Mineral resources, Washington County: Sunderman, Jack A. 07025
Engineering geology
Strip mined lands, use, glaciated vs. nonglaciated land: Guernsey, Lee. 06918
Geochemistry
Coal, proximate and ultimate analyses: Miller, Louis V. 06917
Strip mined lands, spoil banks, pH, relation to glacial till content: Guernsey, Lee. 06918
Geomorphology
Blue Spring Cave, ground-water flow system conduit: Palmer, Arthur N. 06911

Indiana
Geomorphology
Ohio Valley, south-central, terraces: Straw, W. Thomas. 06909
Wyandotte Cave and Blue River terraces, relationship: Powell, Richard L. 06910
Glacial geology
East-central, Erie lobe margin: Wayne, William J. 06915
Ohio Valley, south-central, Wisconsin outwash: Straw, W. Thomas. 06909
Tinley Moraine: Schneider, Allan F. 06914
Hydrogeology
Lost River basin, subterranean drainage routes: Murdock, Stanley H. 0691;
Mitchell Plain, ground-water flow system, Blue Spring Cave conduit: Palmer, Arthur N. 06911
Mineralogy
Clay minerals, Pembroke soils, quantitative analysis: Post, Donald F. 06919
Clay minerals, Pembroke soils, south-central: Post, Donald F. 06903
Stratigraphy
Pennsylvanian, classification: Wier, Charles E. 06916
Structural geology
Tippecanoe County, bedrock surface, computer contouring: Lowell, Brent. 06908

Infrared methods
Applications
Mineral exploration: Reeves, R. G. 06883

Infrared surveys
California
Imperial County, anticline, concretions, distribution: Lintz, Joseph, Jr. 00660
Wyoming
Yellowstone Park, data, calibration in heat flow units: White, Donald E. 00749

Insecta
Palaeoleon ferrogeneticus, n. gen. n. sp.
Cretaceous, Labrador, Redmond iron deposit, neuropteran: Rice, H. M. A. 00830
Palaeopteron complexus, n. gen. n. sp.
Cretaceous, Labrador, Redmond iron deposit, plecopteran: Rice, H. M. A. 00830

Intrusions
Absolute age
California, Oregon, Klamath Mts.: Lanphere, Marvin A. 00658
General
California, Tom Martin complex, petrogenesis: Barrows, Allan G. 00705
Layered
Differentiation, Muskox intrusion, granophyre, Northwest Territories: Pouliot, Gaston. 06930
Plutons
Oregon, Greyback complex: Godchaux, M. M. 00682
Sills
Oregon, Coast Range, differentiation: MacLeod, Norman S. 00647

Intrusions
Structure
California, Mount Diablo: Colburn, Ivan P. 00702
Gravity data, use in prediction: Bonini, W. E. 06830
Invertebrata
Quaternary
Quebec, check list, marine: Wagner, Frances J. E. 06905
Quebec, Lake Saint Jean, marine beds: Dionne, Jean-Claude. 06904
Iron
Analysis
Chemical, ferrous iron in lake sediments, Lake Erie: Ross, Curtis. 07093
Geochemistry
Formation temperatures, Ontario, Labrador: Seguin, Maurice. 06926
System Zn-Fe-S: Campbell, F. A. 06975
System Zn-Fe-S: Chernyshev, L. V. 06979
System Zn-Fe-S: Einaudi, Marco T. 06976
Labrador
Schefferville district, genesis: Seguin, Maurice. 06926
Minnesota
Mesabi Range, taconite, exploration, production: Owens, John S. 06881
Ontario
Michipicoten district, genesis: Seguin, Maurice. 06926
Island arcs
West Indies
Lesser Antilles, evolution from lava composition: Baker, P. E. 07014
Isotopes
Lead
Lead-zinc ores, Mississippi Valley: Cannon, R. S. 06868
Volcanics, abundance, Wyoming: Peterman, Zell E. 00821
Schist
Ratios, Oregon, Colebrook Schist: Coleman, Robert G. 00703
Strontium
Barite, marine, continental differences: Goldberg, Edward D. 00760
Ratios, vein deposits: Reesman, R. H. 06990
Volcanics, abundance, Wyoming: Peterman, Zell E. 00821
Sulfur
Barite, marine, continental differences: Goldberg, Edward D. 00760
Petroleum, fractionation, Wyoming, Wind River basin: Vredenburgh, Larry Dale. 00874
Tritium
International geophysical research project: Suess, Hans E. 00929
Jurassic
Colorado
North-central, Sundance Formation: Pipiringos, G. N. 00774
Jurassic
Montana
Southwestern, Morrison Formation: Suttner, Lee J. 06947
New Mexico
Laguna district, Morrison Formation: Nash, J. Thomas. 06991
Oregon
Southwestern, Myrtle Group, Pelecypoda, zones: Jones, D. L. 00668
Utah
Navajo Sandstone, sedimentation: Marzolf, John. 00648
Wyoming
Big Horn Mountains, Gypsum Spring and Sundance Formations: Furlong, Robert B. 06946
Kansas
Paleontology
Anthozoa, Pennsylvanian, favositid, n.gen.: Cocke, J. M. 06800
Vertebrata, Pliocene, Trego County, WaKeeney local fauna: Wilson, Richard Leland. 06938
Stratigraphy
Pliocene, Ogallala Formation, Trego County: Wilson, Richard Leland. 06938
Kaolin
Geochemistry
Electron-microprobe analysis: Weaver, Charles E. 07040
Kentucky
Economic geology
Clays, Jackson Purchase region, occurrence, properties: Olive, Wilds W. 00753
Coal, petroleum, natural gas, Graham quadrangle: Kehn, Thomas M. 07013
Limestone, Independence quadrangle: Luft, Stanley J. 00840
Mineral resources, Woodstock quadrangle: Weir, Gordon W. 00843
Engineering geology
Foundations, Independence quadrangle: Luft, Stanley J. 00840
Geochemistry
Fluorite district, trace-element distribution: Heyl, A. V. 06872
Maps, geologic
Graham quadrangle: Kehn, Thomas M. 07013
Independence quadrangle: Luft, Stanley J. 00840
Maps, geology
Woodstock quadrangle: Weir, Gordon W. 00843
Stratigraphy
Mississippian, Quaternary, Woodstock quadrangle, section: Weir, Gordon W. 00843
Ordovician, Quaternary, Independence quadrangle, section: Luft, Stanley J. 00840
Labrador
Economic geology
Iron, Schefferville area, genesis: Seguin, Maurice. 06926

Labrador
Paleontology
Insecta, Cretaceous, Redmond iron deposit, new: Rice, H. M. A. 00830

Lakes
Ecology
Eutrophication, mathematical models: Brezonik, Patrick Lee. 07007
Lake Erie, plankton concentrations, relation to hydroxy-apatite: Snow, Phillip D. 07008
Geochemistry
Lake Erie, hydroxy-apatite saturation vs. plankton: Snow, Phillip D. 07008
Lake Erie, water, chemical composition: Weiler, R. R. 07094
Nitrogen cycle in eutrophication, mathematical model: Brezzik, Patrick Lee. 07007
Sediments, ferrous iron analysis, Lake Erie: Ross, Curtis. 07093
Water analysis, methods, Lakes Erie, Ontario: Chawla, V. K. 07092
Geological exploration
Manned submersible, Star 2, Lake Michigan: Somers, Lee H. 07095
Lake Michigan
Northern, subsurface topography, bedrock, sediments: Somers, Lee H. 07086
Sediments
Lake Erie, western, south shore reef area: Herdendorf, Charles E. 07088
Lake Michigan, southwestern, analyses, distribution: Somers, Lee H. 07091
Lakes Erie, Ontario, chlorophyll degradation products: Kemp, A. L. W. 07089
Utah
Great Salt Lake, composition, water source: Straesser, Manfred. 06993

Lava
Physical properties
Hawaii, Alae Lava Lake, density: Peck, Dallas L. 00743
Structural features
California, northeastern, tubes: Howard, Keith A. 00745

Lead
Isotopes
Pb-206,-207,-208, Mississippi Valley lead-zinc districts: Cannon, R. S. 06868
Ratios, Utah: Stacey, J. S. 06945
Ratios, volcanics, Wyoming: Peterman, Zell E. 00821
Maine
Southeastern, occurrence, exploration: Hodder, R. W. 06873
Tennessee
Eastern, geochemical prospecting: Carpenter, R. H. 06834

Limestone
Kentucky
Independence quadrangle, occurrence: Luft, Stanley J. 00840

Limestone
North Dakota
Pembina and Grand Forks Counties, cement-rock possibilities, exploration: Anderson, Sidney B. 07051

Lineations
Regional
Arizona, Gemini and Apollo photography: Lintz, Joseph, Jr. 00661

Louisiana
Geophysical surveys
Saline aquifers, electric logs: Turcan, A. N., Jr. 00721

Magmas
Differentiation
Radioactivity effects, correlation: Tilling, Robert I. 00731
Experimental studies
Melting curves, metal sulfides, formation depth: Sharp, W. E. 00984
Genesis
Hawaii, Honolulu Volcanic Series: Jackson, Everett D. 00747

Magnetic field, Earth
General
Pre-Gilbertian concepts: Smith, Peter J. 07065
Secular variations
Hawaii, lava, Holocene: Doell, Richard R. 00714

Magnetic methods
Airborne
Anomalies, relation to remanent magnetism, Nevada: Bath, Gordon D. 06806
Mineral exploration with widely spaced profiles: Zietz, I. 06864
Interpretation
Least-squares method, two-dimensional structures: Johnson, William W. 00938

Magnetic properties
Measurements
Colorado-New Mexico, dike rocks: Larson, E. E. 00926
Nevada Test Site, volcanics: Bath, Gordon D. 06806

Magnetic surveys
Atlantic Ocean
United States, continental margin, interpretation, edge effect: Keen, M. J. 00948
Caribbean Sea
Bartlett Trough, western: Banks, Norman G. 00754
Nevada
Regional, airborne, mineral exploration: Mabey, D. R. 06848
Pacific Ocean
Aleutian trench area, fracture zones: Grim, Paul J. 00924
Eastern, off central California, interpretation: Bassinger, B. G. 00923

Maine
Absolute age
Penobscot Bay, volcanics, Rb-Sr: Brookins, D. G. 00741

Maine
Economic geology
Lead-zinc, southeastern, exploration history: Hodder, R. W. 06873
Stratigraphy
Ordovician(?), Quimby–Greenvale Cove Formations, western: Moench, Robert H. 00773
Major-element analyses
Coal
Indiana, proximate and ultimate: Miller, Louis V. 06917
Diabase
North Carolina Piedmont: Ragland, Paul C. 07069
Ground water
Alabama, Conecuh County: Reed, P. C. 07071
Alabama, Covington County: Turner, J. D. 06966
Alabama, Crenshaw County: McWilliams, R. G. 07074
Alabama, Dale County: Newton, J. G. 07073
Alabama, Henry County: Newton, J. G. 07075
Alabama, Pike County: Shamburger, V. M., Jr. 07070
California, Fremont Valley area: U.S. Geological Survey. 00960
Senaite
Relation to magnetoplumbite, davidite: Rouse, Roland C. 07005
Sulfide schists
Canada: Boyle, R. W. 06978
Surface water
Alabama, Conecuh County: Reed, P. C. 07071
Alabama, Crenshaw County: McWilliams, R. G. 07074
Alabama, Dale County: Newton, J. G. 07073
Alabama, Henry County: Newton, J. G. 07075
Alabama, Pike County: Shamburger, V. M., Jr. 07070
Water
Lake Erie, chemical composition: Weiler, R. R. 07094
Malacostraca
Cancer
North America, west coast, fossil record: Nations, J. Dale. 00637
Mammalia
Allodesmus kernensis
Miocene, California, Kern County: Barnes, Lawrence G. 00709
Antiacodon pygmaeus
Utah, Eocene, Green River Formation, new occurrence: Burke, J. J. 00847
Beckia grangerensis, n.gen. n.sp.
Pliocene, Washington, Ellensburg Formation, mustelid: Bryant, Laurie J. 06802
Bison latifrons
Pleistocene, California, Rancho La Brea: Miller, Wade E. 06900
Mammalia
Canidae
Pliocene–Pleistocene, evolution: Williams, C. Thomas. 00806
Cricetidae
Pliocene, Kansas, WaKeeney local fauna, new: Wilson, Richard Leland. 06938
Dinohyus
Miocene, South Dakota, Sharps Formation, skull: Green, Morton. 07000
Diprotodontidae
Cenozoic skeletal specializations: Waters, Barbara K. 00802
Equidae
Oligocene–Holocene, manus osteology, evolution, paleoecology: Sondaar, P. Y. 07006
Geographic distribution
North America, nearctic sloths, Pliocene: Hirschfield, Sue Ellen. 00673
Hyracodon
Tertiary, dentition, evolution: Hanson, C. Bruce. 06997
Morphology
Cursorial, pelvic characteristics: Dalzell, Bonnie Brooks. 00680
Rodentia, incisor enamel, variability: Wahlert, John H. 07023
Talpidae, osteology, living cf. fossil: Hutchison, J. Howard. 06922
Ondatra
Pleistocene, South Dakota, Bennett, Walworth, Lincoln Counties: Harksen, J. C. 06895
Parydrosorex concisus, n.gen. n.sp.
Pliocene, Kansas, WaKeeney local fauna: Wilson, Richard Leland. 06938
Quaternary
Nevada, Lincoln County, cave deposits, Pleistocene: Jefferson, G. T. 00666
Talpidae
Tertiary, Oregon, taxonomy, morphology, n.gen. n.spp.: Hutchison, J. Howard. 06922
Tanupolama sp.
Pleistocene, California, Rancho La Brea: Miller, Wade E. 06900
Taxonomy
Talpidae, Cenozoic, North America, review: Hutchison, J. Howard. 06922
Tertiary
Kansas, Trego County, WaKeeney local fauna: Wilson, Richard Leland. 06938
Torrejonia wilsoni
Paleocene, New Mexico, Nacimiento Fm.: Gazin, C. Lewis. 07024
Manganese
Abundance
Carbonaceous chondrites: Yates, Ann M. 06999
Ore deposits, general
Mineralogy, occurrence: Roy, Supriya. 06986
Manitoba
Absolute age
C-14, University of Wisconsin list: Bender, Margaret M. 00839

Manitoba
Maps, magnetic
Anderson Point area, airborne: Canada Geological Survey. 00996
Barrows area, airborne: Canada Geological Survey. 01056
Belanger Point area, airborne: Canada Geological Survey. 01019
Berens River area, airborne: Canada Geological Survey. 01005
Birch Island area, airborne: Canada Geological Survey. 01044
Bradbury River area, airborne: Canada Geological Survey. 00998
Bull Head area, airborne: Canada Geological Survey. 00997
Chitek Lake area, airborne: Canada Geological Survey. 01036
Clark Point area, airborne: Canada Geological Survey. 01022
Commissioner Island area, airborne: Canada Geological Survey. 01004
Costes Lake area, airborne: Canada Geological Survey. 01009
Crossing Island area, airborne: Canada Geological Survey. 01053
Davidson Lake area, airborne: Canada Geological Survey. 01050
Dawson Bay area, airborne: Canada Geological Survey. 01057
Denbeigh Point area, airborne: Canada Geological Survey. 01046
Eagle Island area, airborne: Canada Geological Survey. 01033
English Brook area, airborne: Canada Geological Survey. 00993
George Islands area, airborne: Canada Geological Survey. 01017
Grand Rapids area, airborne: Canada Geological Survey. 01039
Harwill area, airborne: Canada Geological Survey. 01011
Hecla Island area, airborne: Canada Geological Survey. 00995
Hodgson area, airborne: Canada Geological Survey. 01010
Howell Point area, airborne: Canada Geological Survey. 01041
Jackhead Lake area, airborne: Canada Geological Survey. 01003
Katimik Lake area, airborne: Canada Geological Survey. 01038
Koostatak area, airborne: Canada Geological Survey. 01001
Limestone Bay area, airborne: Canada Geological Survey. 01034
Long Point area, airborne: Canada Geological Survey. 01031
Lynx Bay area, airborne: Canada Geological Survey. 01014
Marchand Creek area, airborne: Canada Geological Survey. 01007
Moose Islands area, airborne: Canada Geological Survey. 01002

Manitoba
Maps, magnetic
Mossy Point area, airborne, Canada Geological Survey. 01006
Mossy Portage area, airborne: Canada Geological Survey. 01052
Napanee Bay area, airborne: Canada Geological Survey. 01047
Nason Point area, airborne: Canada Geological Survey. 01054
Norris Lake area, airborne: Canada Geological Survey. 01048
Norway House area, airborne: Canada Geological Survey. 01021
Pelican Bay area, airborne: Canada Geological Survey. 01051
Playgreen Lake area, airborne: Canada Geological Survey. 01026
Point Laronde area, airborne: Canada Geological Survey. 01045
Reedy Lake area, airborne: Canada Geological Survey. 01028
Reindeer Island East area, airborne: Canada Geological Survey. 01015
Reindeer Island West area, airborne: Canada Geological Survey. 01023
Selkirk Island area, airborne: Canada Geological Survey. 01040
Shallow Lake area, airborne: Canada Geological Survey. 00994
Sheet 63 A:2, airborne: Canada Geological Survey. 00999
Sheet 63 A:12, airborne: Canada Geological Survey. 01016
Sheet 63 B:2, airborne: Canada Geological Survey. 01027
Sheet 63 B:10, airborne: Canada Geological Survey. 01029
Sheet 63 B:3, airborne: Canada Geological Survey. 01035
Sheet 63 G:7, airborne: Canada Geological Survey. 01032
Sheet 63 G:12, airborne: Canada Geological Survey. 01049
Sheet 63 H:6, airborne: Canada Geological Survey. 01008
Sheet 63 H:4, airborne: Canada Geological Survey. 01018
Sheet 62 P:12, airborne: Canada Geological Survey. 01012
Sheets 63 B:9 and B:16, airborne: Canada Geological Survey. 01024
Sheets 63 G:1, G:8 and G:9, airborne: Canada Geological Survey. 01025
Shorncliffe area, airborne: Canada Geological Survey. 01000
Sisib Lake area, airborne: Canada Geological Survey. 01037
Spruce Island area, airborne: Canada Geological Survey. 01055
Sturgeon Bay area, airborne: Canada Geological Survey. 01013
Warren Landing area, airborne: Canada Geological Survey. 01020

Manitoba
Maps, magnetic
Waterhen Lake North area, airborne: Canada Geological Survey. 01043
Wicked Point area, airborne: Canada Geological Survey. 01030
William Lake area, airborne: Canada Geological Survey. 01042
Mantle
Experimental studies
Equations of state, periclase: Wang, Chi-yuen. 00992
Equations of state, shock and isothermal: Knopoff, L. 00989
Equations of state, shock reduced to isothermal: Shapiro, J. N. 00990
Physical properties
Velocity anisotropy of upper: Morris, G. B. 00897
Processes
Convection, time of cessation: Carr, Jerome B. 07001
Convection, with variable physical properties: Turcotte, D. L. 00922
Structure
Research since 1961, review: Knopoff, Leon. 00942
Marine geology
Bottom features
Atlantic Ocean, Barbados ridge, genesis: Chase, Richard L. 00928
Caribbean Sea, Bartlett Trough, western: Banks, Norman G. 00754
Deep-sea fan valleys, off California, Holocene, Miocene: Normark, W. R. 00642
Northeastern, seamount, petrology: Nayudu, Y. R. 00638
Pacific Ocean, Bering Sea, geophysical data, review: Stone, D. B. 07062
Ridges, topography, relation to convection currents: Turcotte, D. L. 00922
Santa Cruz basin off California: Barnes, Peter W. 00913
Submarine canyons, Maryland-Virginia, erosional origin: Uchupi, Elazar. 07060
Submarine canyons off Mexico, Rio Balsas canyon, genesis: Reimnitz, Erk. 00907
Geophysical surveys
Pacific Ocean, northeastern, Pioneer Fracture-Delgada Fan intersection: Winterer, E. L. 07061
Instruments
Samplers, sea water, terrigenous detritus: Folger, D. W. 06992
Methods
Continental margin, application of onshore methods: Osborn, B. C. 00911
Processes
Sea-floor spreading, Antilles area: Chase, Richard L. 00928
Sediments
Atlantic Ocean, Glomar Challenger drilling program: Field, A. J. 00905
Carbonate, Mexico, Yucatan shelf: Logan, Brian W. 00763
Marine geology
Sediments
Carbonate, Mexico, Yucatan shelf: Logan, Brian W. 00771
Continental shelf off Washington: Venkatarathnam, K. 00912
Geochemistry, Holocene, fatty acids, North Atlantic: Cooper, W. J. 07059
Honduras-Guatemala, continental shelf, slope: Kornicker, Louis S. 00766
Provenance, deposition processes, Santa Barbara basin: Soutar, Andrew. 00893
Santa Cruz basin off California: Barnes, Peter W. 00913
Maryland
Stratigraphy
Cretaceous-Tertiary boundary, eastern: Minard, James P. 00752
Massachusetts
Hydrogeology
Assabet River basin, ground-water resources: Pollock, S. J. 00757
Tenmile and Taunton River basins, ground-water resources: Williams, John R. 07035
Maps, geologic
Blue Hills quadrangle: Chute, Newton E. 00956
Maps, ground water
Assabet River basin: Pollock, S. J. 00757
Tenmile and Taunton River basins, northern: Williams, John R. 07035
Stratigraphy
Precambrian-Pennsylvanian, Blue Hills quadrangle: Chute, Newton E. 00956
Mercury
Abundance
Thermal springs, fumeroles, California, El Salvador: Koenig, James B. 00656
Exploration
Abundance in soil gas, air: McCarthy, J. H. 06849
Mesozoic
California
Garrett Tunnel area, stratigraphy, structural relations: Berkland, James O. 00706
Wilbur Springs quadrangle, Great Valley sequence: Rich, Ernest I. 00867
Central America
Northern, tectonic history, sedimentation: Dengo, Gabriel. 00770
Colorado
Slick Rock district, stratigraphy: Shawe, Daniel R. 07018
Gulf Coastal Plain
Correlation, eastern, cross sections: Maher, John C. 07067
Mexico
Baja California, Jurassic-Cretaceous contact, depositional: Minch, John A. 00652
Nevada
Humboldt Range, Star Peak Group and other lower Mesozoic strata: Silberling, N. J. 00958

Metals
Ore deposits, general
Ore-forming fluids: Joralemon, Ira B. 06981
Washington
Chewelah Mountain area, occurrence: Clark, Lorin D. 07057
Metamorphic rocks
Amphibolite
Geochemistry, British Columbia: Petro, V. A. 00815
Mineral composition, genesis from non-igneous sources: Orville, Philip M. 00759
General
General description, California, northern, Franciscan units: Suppe, John. 00790
General description, Washington, Cascade Mts., Paleozoic history: Ellingson, Jack A. 00694
Petrology, California, Siskiyou County, gradational sequence: Barrows, Allan G. 00677
Petrology, North Carolina, Slate Belt: Randazzo, Anthony F. 00866
Structural features, textures, North Carolina, Hanging Rock area: Centini, Barry Austin. 00860
Gneiss
Absolute age, Montana, Jardine-Crevice Mountain area: Brookins, Douglas G. 06974
Iron formation
Petrology, Minnesota, Biwabik Iron Fm.: Bonnichsen, Bill. 00859
Marble
General description, Wyoming, White Mtn.: Nelson, Willis H. 00639
Physical properties, microstructural techniques: Willard, R. J. 00968
Mineral assemblages
California, Diablo Range, Franciscan Fm., zones: Blake, M. C., Jr. 00678
Manganese minerals: Roy, Supriya. 06986
Oregon, Greyback intrusive complex, contact aureole: Godchaux, M. M. 00682
Mineral facies
Blueschist facies, petrogenesis, oxidation-reduction reactions: Gresens, Randall L. 00685
North Carolina-Tennessee, Great Smoky Mts., Thunderhead Sandstone: Allen, Gary Curtiss. 00857
Schist
Absolute age, Montana, Jardine-Crevice Mountain area: Brookins, Douglas G. 06974
Petrology, structural features, Oregon, Colebrook Schist: Coleman, Robert G. 00703
Petrology, Washington, Chiwaukum Schist: Plummer, Charles C. 00817
Serpentinite
Physical properties, structural features, California, Fresno County, flows: Cowan, Darrel S. 00704
Metamorphic rocks
Sulfide schists
Petrology, fahlbands: Boyle, R. W. 06978
Textures
Mylonite, definition: Theodore, Ted G. 00797
Metamorphism
Contact
Minnesota, Dunka River area, Biwabik Iron Fm.: Bonnichsen, Bill. 00859
Oregon, Greyback intrusive complex: Godchaux, M. M. 00682
Washington, Cascades, Chiwaukum Schist: Plummer, Charles C. 00817
Regional
North Carolina-Tennessee, Great Smoky Mts., Thunderhead Sandstone: Allen, Gary Curtiss. 00857
Zoning
California, Diablo Range, Franciscan Fm.: Blake, M. C., Jr. 00678
Manganese minerals: Roy, Supriya. 06986
Metasomatism
Process
CO_2 liberation, California, Salton Sea geothermal system: Muffler, L. J. Patrick. 06896
Scheelite
South Dakota, Harney Peak dome, southwestern: Kernaghan, James S. 06891
Meteor craters
Arctic
Distribution, age, Canada, Alaska, Greenland: Sandner, Werner. 06955
Meteorites
Composition
Carbonaceous chondrites, Cr, Mn: Yates, Ann M. 06999
Platinum metals, abundances: SenGupta, J. G. 06987
General
Michigan falls: Chamberlain, Von Del. 06970
Genesis
Shock history, correlation with Ga-Ge content and exposure age: Jaeger, Ralph R. 06920
Octahedrites
Shock history, correlation with Ga-Ge content and exposure age: Jaeger, Ralph R. 06920
Organic matter
Biogenic and indigenous nature, terrestrial contaminant: Claus, George. 06954
Mexico
Absolute age
C-14, ISOTOPES' list: Buckley, James D. 00834
C-14, Smithsonian Institution list: Mielke, James E. 00837
C-14, UCLA list: Berger, Rainer. 00823
Geophysical surveys
Seismic methods, petroleum exploration: FragaPurata, Jorge A. 07020

Mexico
Paleontology
Mammalia, Pliocene, Chihuahua, horses, evolution: Sondaar, P. Y. 07006
Petrology
Baja California, Jacumba volcanics cf. Santa Rosa volcanics: Hawkins, James W., Jr. 00670
Sedimentary petrology
Yucatan shelf, carbonate sediments: Logan, Brian W. 00763
Yucatan shelf, carbonate sediments and reefs: Logan, Brian W. 00771
Yucatan shelf, coral reefs: Logan, Brian W. 00764
Stratigraphy
Jurassic–Cretaceous, depositional contact, Baja California: Minch, John A. 00652
Paleozoic, basement rocks, Yucatan Peninsula: Bass, M. N. 00730
Structural geology
Gulf of California, evolution, plate tectonics, vulcanism: Hawkins, James W., Jr. 00670
Michigan
Economic geology
Copper, Keweenaw district, associated clay alteration: Ruotsala, Albert P. 06961
Copper, Nonesuch Shale: Joralemon, Ira B. 06981
General
Meteorite falls: Chamberlain, Von Del. 06970
Geophysical surveys
Application, subsurface surveying: Malott, D. F. 06879
Hydrogeology
Gogebic County, ground-water resources: Doonan, C. J. 06989
Maps, geologic
Gogebic County, surficial, water availability: Doonan, C. J. 06989
Paleontology
Anthozoa, Devonian, Silica Formation, rugose fauna, n.spp.: Stumm, Erwin C. 06902
Crinoidea, Devonian, Bell Shale, scytalocrinid: Kesling, Robert V. 06942
Crinoidea, Devonian, Silica Formation, n.sp.: Kesling, Robert V. 06939
Micropaleontology
Geographic distribution
Miocene nannoplankton, tropical zones: Wilcoxon, J. A. 00947
Mississippian
Newfoundland, Codroy Group: Mamet, B. L. 06935
Tertiary
California, Luisian and Mohnian, Newport Beach: Wilcoxon, J. A. 00947
Microscope methods
Textbooks
Optical crystallography, polarized light behavior, graphic representation: Wahlstrom, Ernest E. 00957
Microseisms
Interpretation
Bermuda area, ocean floor records: Latham, Gary Vincent. 00862
Recording
Ocean floor, Bermuda area: Latham, Gary Vincent. 00862
Structure
Estimation, using large aperture array: Lacoss, R. T. 00945
Mineral data
Barite
Composition, trace-elements, marine vs. continental: Goldberg, Edward D. 00760
Chalcopyrite
Structure, derivative of sphalerite: Mariano, Anthony Nick. 00863
Clinopyroxene
Bonding, isostructural with diopside: Clark, Joan R. 07078
Dolomite
Genesis, secondary, ultramafic bodies, California, Oregon: O'Neil, James R. 00748
Feldspar
Lead, isotope ratios: Stacey, J. S. 06945
Galena
Melting curves, 30–65 kb: Sharp, W. E. 00984
Hydrothermal minerals
Wyoming, Yellowstone Park drill hole Y-1: Honda, S. 00750
Layer silicates
Crystal chemistry, iron analysis, Mossbauer spectroscopy: Taylor, G. L. 06960
Manganese minerals
Geochemistry: Roy, Supriya. 06986
Muscovite
Composition, New Mexico, Precambrian: Stensrud, Howard L. 00788
Periclase
Experimental studies, elasticity, equation of state: Wang, Chi-yuen. 00992
Pyrite
Decomposition curve, 30–65 kb: Sharp, W. E. 00984
Pyrrhotite
Melting curves, 30–65 kb: Sharp, W. E. 00984
Quartz
Coesite–stishovite transition: Akimoto, Syun-iti. 00985
Senaite
Parameters, polytypism: Rouse, Roland C. 07005
Sphalerite
Geochemistry, Quebec, Quemont mine: Campbell, F. A. 06975
Geochemistry, subsolidus: Chernyshev, L. V. 06979
Melting curves, 30–65 kb: Sharp, W. E. 00984
Tourmaline
Color, origin and changes, optical absorption spectra: Wilkins, R. W. T. 00972
Zeolites
Genesis, Nevada, nuclear test site: Hoover, D. L. 06798

Mineral data
Zircon
United States, southeastern, Precambrian volcanics, absolute age: Rankin, D. W. 00740
Mineral deposits, genesis
Classification
Epigenetic vs. syngenetic deposits: Ridge, J. D. 06853
Clays
Washington, Spokane County: Hosterman, J. W. 00825
Geochemical affinities
Copper, California, Plumas County: Smith, Arthur R. 00785
Nevada, Copper Canyon stock, halo: Theodore, Ted G. 00796
Gold
North Carolina, Slate Belt, volcanigenic: Worthington, J. E. 06863
Placers, bedrock values: Krook, Leendert. 06980
Igneous processes
Lead, Utah: Stacey, J. S. 06945
Manganese
General, review: Roy, Supriya. 06986
Metamorphism
Canada, fahlbands: Boyle, R. W. 06978
Tennessee, Ducktown: Salotti, C. A. 06856
Ore-forming fluids
Origin, general: Joralemon, Ira B. 06981
Polymetallic ores
Utah, Star district, Old Moscow mine: Abou-Zied, Mohamed Saleh. 00856
Source rocks
Strontium, isotopes: Reesman, R. H. 06990
Structural controls
Nevada, Gold Acres open-pit mine: Wrucke, Chester T. 00808
Utah, fault trends: Stokes, William Lee. 06985
Tungsten
South Dakota, Harney Peak dome, southwestern, metasomatic: Kernaghan, James S. 06891
Uranium
New Mexico, Jackpile Sandstone: Nash, J. Thomas. 06991
Texas, Coastal Plain: Eargle, D. Hoye. 00971
Mineral economics
Canada
Petroleum and natural gas industry: Hilborn, James D. 07079
Coal
Pennsylvania, production history, industrial development, reserves: Edmunds, William E. 07076
Development
Value of mineral surveys: Herfindahl, Orris F. 06842
Energy fuels and minerals
Revolution in science and technology: Travis, Maury M. 06972
Property evaluation
X-ray analyzer, portable, and drillhole probes: Campbell, W. J. 06833
Mineral exploration
Automatic data processing
Techniques, computer analysis: Rychkun, Edward A. 06884
Techniques, storage, retrieval: Eimon, Paul I. 06871
General
Orebodies, concealed, "baseline" program: Peters, W. C. 06852
Geochemical methods
Trace-element distributions, igneous rocks: Neuerburg, G. J. 06851
Geophysical methods
Electromagnetic, inductive, rough terrain: Alexander, Paul B. 06984
Gamma-ray spectrometry, advantages: Adams, J. A. S. 06826
Placers, Bering Sea: Hopkins, D. M. 06844
Ore guides
Alteration zones, porphyry copper deposits, Arizona: Guilbert, J. M. 06839
Arizona, New Mexico, porphyry copper cappings: Weiss, Richard Lawrence. 00876
Instruments, X-ray analyzer, drillhole probes: Campbell, W. J. 06833
Structural, Arizona: Wertz, J. B. 06860
Structural, fold geometries, orogenic belts: Brown, Severn P. 06832
Utah, fault trends: Stokes, William Lee. 06985
Mineral zoning
Manganese deposits
General, geochemistry: Roy, Supriya. 06986
Zeolites
Nevada, Pahute Mesa-Yucca Flat area: Hoover, D. L. 06798
Mineralogy
Crystal growth
Fluid inclusions, leakage: Roedder, Edwin. 06943
Physical properties
Dichroism, genesis, tourmaline: Wilkins, R. W. T. 00972
Textbooks
Optical crystallography, polarized light behavior: Wahlstrom, Ernest E. 00957
Mining geology
Automatic data processing
Open pits, computer applications: Adams, B. W. 06865
Production control
Minnesota, Mesabi Range: Owens, John S. 06881
Technology
Open pit slope stability, model study, Nevada, Ely area: Blake, Wilson. 07010
Minnesota
Economic geology
Iron, Mesabi Range, taconite: Owens, John S. 06881
General
Artifacts, Cambria Site, Blue Earth County: Watrall, Charles R. 06988

Minnesota
Geophysical surveys
Duluth complex area, gravity: Ikola, R. J. 06875
Hydrogeology
North-central, Mississippi headwaters area, resources: Oakes, E. L. 07058
Maps, ground water
North-central, Mississippi headwaters watershed: Oakes, E. L. 07058
Petrology
Dunka River area, Biwabik Iron Fm., metamorphism: Bonnichsen, Bill. 00859
Miocene
Nevada
Nye County, igneous rocks: Anderson, R. Ernest. 06807
Mississippi
Engineering geology
Lamar County, nuclear test site: Summers, George E. 06888
Lamar County, nuclear test site, salt dome stability: Nair, Keshavan. 06886
Mississippi Valley
Geochemistry
Lead-zinc districts, lead isotope variations: Cannon, R. S. 06868
Upper, geochemical prospecting, lead, zinc: Keith, John R. 06877
Upper, lead-zinc district, trace-element distribution: Heyl, A. V. 06872
Mississippian
Montana
East-central, Kibbey Formation, Ray Member, new: Rawson, Richard R. 06973
Nevada
Correlation, White Pine Group: Moore, D. M. 00776
Newfoundland
Saint Georges Bay area, Foraminifera, Codroy Group: Mamet, B. L. 06935
North Dakota
Williston basin, Kibbey Member, Ray Member, new: Rawson, Richard R. 06973
United States
Central, Asterozoa, morphology: Bjork, Philip R. 06901
Missouri
Geomorphology
Ozark Mountains, Hurricane Creek basin, karst: Aley, Thomas. 07052
Saint Francis River basin, landform evolution, lithologic influences: Hosking, Peter Leighton. 00855
Hydrogeology
Ozark Mountais, Hurricane Creek basin, karst watershed: Aley, Thomas. 07052
Mollusca
Scaphites hippocrepis
Cretaceous, United States, western interior: Cobban, William A. 00975
Scaphites leei
Cretaceous, United States, western interior: Cobban, William A. 00975
Mollusca
Tertiary
California, Merced(?) Formation, Pliocene: Addicott, W. O. 00711
Molybdenum
British Columbia
Exploration, geochemical: Horsnail, R. F. 06845
Montana
Absolute age
Jardine-Crevice Mountain area, Precambrian rocks: Brookins, Douglas G. 06974
Geophysical surveys
Intrusions, shape, gravity: Bonini, W. E. 06830
Mineralogy
Clay minerals, Morrison and Kootenai Fms.: Suttner, Lee J. 06947
Paleontology
Pisces, Pennsylvanian, Bear Gulch Fm., Fergus County: Melton, William G. 00650
Vertebrata, Cretaceous, Judith River Fm.: Sahni, Ashok. 00869
Stratigraphy
Mississippian, Kibbey Formation, Ray Member: Rawson, Richard R. 06973
Oligocene-Pliocene, Bozeman Group, Beaverhead River Basin: Petkewich, Richard M. 00782
Tertiary, Cabbage Patch beds, Granite-Powell Counties: Fields, Robert W. 00681
Nebraska
Hydrogeology
Antelope County, water resources: Souders, V. L. 07053
Maps, ground water
Antelope County: Souders, V. L. 07053
Nevada
Absolute age
Fish Creek Mountains volcanic center, ignimbrite: McKee, Edwin H. 00649
Humboldt County, volcanic glass, K-Ar: Noble, Donald C. 00641
Nye and Esmeralda Counties, volcanic rocks: Kistler, Ronald W. 06796
Ruby Mountains, metamorphism, Rb-Sr: Kistler, Ronald W. 00655
Southern, volcanics, fault systems: Ekren, E. B. 06795
Tenabo area, intrusive rocks, K-Ar: Silberman, M. L. 00809
Areal geology
Lincoln County, West Range and Ely Springs Range: Langenheim, R. L., Jr. 00657
Nevada Test Site region, symposium 1966: Eckel, Edwin B. 06820
Washoe-Pershing Counties, Nightingale and Truckee Ranges: Rai, Vijai N. 00820
Economic geology
Gold, Gold Acres open pit, structural controls: Wrucke, Chester T. 00808
Engineering geology
Materials, properties, Nevada Test Site, Cenozoic volcanics: Healey, D. L. 06809

Nevada
Engineering geology
Materials, properties, Nevada Test Site, volcanic rocks: Carroll, Roderick D. 06819
Materials, properties, Yucca Flat, granitic rock: Ege, John R. 06812
Nuclear explosions, fracture patterns: Barosh, Patrick J. 06813
Nuclear explosions, Nevada Test Site, ground-water contamination: Essington, Edward H. 06797
Nuclear explosions, site appraisal: Houser, F. N. 06823
Nuclear explosions, southern, geologic results, general: Eckel, Edwin B. 06821
Nuclear explosions, underground test site, fault displacement: Dickey, D. D. 06814
Slope stability, Ely area, Kimbley pit, model study: Blake, Wilson. 07010
Underground excavation, Yucca Flat, stability index: Ege, John R. 06812
Geochemistry
Copper Canyon stock, halo, geochemical affinities: Theodore, Ted G. 00796
Nevada Test Site, volcanics, zeolitization: Hoover, D. L. 06798
Geomorphology
Yucca Flats area, alluvial fans: Fernald, Arthur T. 06825
Geophysical surveys
Nevada Test Site and vicinity, gravity: Healey, D. L. 06809
Nevada Test Site, volcanic rocks, well logging: Carroll, Roderick D. 06819
Regional airborne: Mabey, D. R. 06848
Hydrogeology
Nevada Test Site, ground-water contamination: Essington, Edward H. 06797
South-central, ground-water movement, structural control: Winograd, Isaac J. 06824
Maps, geologic
Medicine Range, Elkton County: Collinson, James W. 06949
Mineralogy
Illite, dolomite, eastern, White Pine Group, horizon markers: Moore, D. M. 00776
Zeolites, Nevada Test Site, genesis: Hoover, D. L. 06798
Paleomagnetism
Tertiary, volcanics, Nevada Test Site: Bath, Gordon D. 06806
Paleontology
Algae, Ordovician, Pogonip Group, Arrow Canyon Range: Pierce, R. W. 00816
Brachiopoda, Cephalopoda, Mississippian–Pennsylvanian: Gordon, Mackenzie, Jr. 06810
Cephalopoda, conodonts, Permi[illegible]-Triassic, Arcturus–Park City Groups [illegible] Thaynes Fm.: Collinson, James W. 06949
Cephalopoda, Mesozoic, lower, Humboldt Range, ammonite fauna: Silberling, N. J. 00958

Nevada
Paleontology
Mammalia, Pleistocene, cave deposits, Lincoln County: Jefferson, G. T. 00666
Petrology
Goldfield–Tonopah region, Cenozoic volcanics: Vitaliano, Charles J. 00799
Humboldt County, peralkaline volcanics: Noble, Donald C. 00641
Lincoln County, Kane Wash Tuff, eruptive history: Noble, Donald C. 06818
Mono Basin, Cenozoic volcanics: Al-Rawi, Yehya. 00712
Nye County, Miocene igneous rocks, intermediate composition, type: Anderson, R. Ernest. 06807
Nye County, Silent Canyon volcanic center, Belted Range Tuff: Noble, Donald C. 06808
Pahute Mesa, Silent Canyon volcanics, eruptive history: Orkild, Paul P. 06815
Pliocene, Timber Mountain Tuff, ash-flow sheets: Byers, F. M., Jr. 06816
Sedimentary petrology
Arrow Canyon Range, Ordovician–Silurian rocks, environments: Stieglitz, Ronald D. 00787
Yucca Flats area, surficial deposits: Fernald, Arthur T. 06825
Stratigraphy
Mesozoic, lower, Star Peak Group and younger strata, Humboldt Range: Silberling, N. J. 00958
Mississippian, White Pine Group, mineralogic marker horizons: Moore, D. M. 00776
Mississippian–Pennsylvanian, Eleana and Tippipah formations: Gordon, Mackenzie, Jr. 06810
Nevada Test Site and Nellis Air Force Range: Ekren, E. B. 06822
Ordovician, Pogonip Group, Arrow Canyon Range, new units: Pierce, R. W. 00816
Permian–Triassic, Arcturus–Park City Groups and Thaynes Fm., northeastern: Collinson, James W. 06949
Precambrian–Cambrian, unconformity, Ruby Mts.: Kistler, Ronald W. 00655
Snake Mountains, northern, thrust sequences: Gardner, Douglas Hanson. 00861
Structural geology
Fish Creek Mountains volcanic center, faulting: McKee, Edwin H. 00649
Gold Acres open-pit mine, controls: Wrucke, Chester T. 00808
Nevada Test Site and Nellis Air Force Range: Ekren, E. B. 06822
Nevada Test Site and Nellis bombing range, fault systems, age: Ekren, E. B. 06795
Nevada Test Site region, thrust-fault system: Barnes, Harley. 06793
Pahute Mesa, Silent Canyon caldera, collapse, structures: Orkild, Paul P. 06815
Snake Mountains, northern, thrust faults: Gardner, Douglas Hanson. 00861
South-central, faults: Winograd, Isaac J. 06824

Nevada
Structural geology
Timber Mountain caldera, collapse, resurgence: Byers, F. M., Jr. 06816
Timber Mountain, resurgent dome, fault : Carr, W. J. 06817
Yucca Flat area, faults, folds: Hinrichs, E. Neal. 06794
Yucca Flat, faults and joints, explosion-produced fractures: Barosh, Patrick J. 06813
New Hampshire
Maps, magnetic
Beach Hill area, airborne: U.S. Geological Survey. 00955
New Jersey
Geophysical surveys
Ogdensburg, earth tide, observations, areal strain: Kuo, John T. 00983
Maps, geologic
Belvidere quadrangle: Drake, Avery Ala, Jr. 00950
Sedimentary petrology
Triassic argillite and shale, weathered zone: Lodding, William. 07030
Stratigraphy
Belvidere quadrangle, sections: Drake, Avery Ala, Jr. 00950
Cretaceous–Tertiary boundary: Minard, James P. 00752
Weathering
Triassic argillite and shale, clay mineralogy: Lodding, William. 07030
New Mexico
Absolute age
C-14, UCLA list: Berger, Rainer. 00823
Economic geology
Copper, porphyry deposits, cappings as ore guides: Weiss, Richard Lawrence. 00876
Uranium, Laguna district, Jackpile Sandstone, genesis: Nash, J. Thomas. 06991
Geochemistry
Northern, Precambrian rocks, muscovite: Stensrud, Howard L. 00788
Hydrogeology
Delaware basin, saline-water data, computer program: Hiss, William L. 00719
Navajo Indian Reservation, ground-water resources: Cooley, M. E. 00959
Maps, geologic
Escabosa quadrangle: Myers, Donald A. 00841
Navajo Indian Reservation: Cooley, M. E. 00959
Paleomagnetism
Eocene, dike rocks, Shiprock: Larson, E. E. 00926
Paleontology
Mammalia, Paleocene, Nacimiento Fm., San Juan basin: Gazin, C. Lewis. 07024
New York
Areal geology
New York City region, geologic evolution, guidebook: Schuberth, Christopher J. 06968
New York
Geomorphology
New York City region, landform evolution: Schuberth, Christopher J. 06968
Glacial geology
Southeastern, chattermarks, Shawangunk conglomerate: Laverdiere, Camille. 07002
Paleontology
Protista, acritarchs, Silurian, western, new: Deunff, Jean. 06923
Trilobita, Ordovician, Chazy Group, Champlain Valley: Shaw, Frederick C. 07019
Stratigraphy
Ordovician, Chazy Group, Champlain Valley, correlation: Shaw, Frederick C. 07019
Ordovician, northwestern, Trentonian Series, limestone units: Kay, Marshall. 06936
Newfoundland
Paleontology
Foraminifera, Mississippian, Codroy Group, St. Georges Bay: Mamet, B. L. 06935
Nickel
General
Industry review, worldwide: Mining Engineering. 06805
North America
Earthquakes
Magnitude, southwestern, cf. nuclear explosions: Basham, P. W. 00932
General
Bibliography, 1965: U.S. Geological Survey. 00846
Maps, geoid
Revision of 1960 map: Fischer, Irene. 07077
Paleomagnetism
Polar wandering curves, cf. Europe, continental drift: Hospers, J. 07064
Paleontology
Malacostraca, west coast, *Cancer*: Nations, J. Dale. 00637
Mammalia, Oligocene–Holocene, horses, evolution: Sondaar, P. Y. 07006
Mammalia, Pliocene, nearctic sloths, distribution: Hirschfield, Sue Ellen. 00673
Structural geology
Appalachians, Saint Lawrence region, continental drift: Dineley, D. L. 07016
North Carolina
Economic geology
Gold, genesis, Slate Belt: Worthington, J. E. 06863
Petrology
Great Smoky Mountains, Thunderhead Sandstone, metamorphism: Allen, Gary Curtiss. 00857
Piedmont, diabase, Triassic dikes: Ragland, Paul C. 07069
Union County, Slate Belt: Randazzo, Anthony F. 00866

North Carolina
Sedimentary petrology
Black Creek Formation, depositional environments: Benson, Paul Harrison, 3d. 00858
Structural geology
Stokes County, Hanging Rock area, metamorphic rocks: Centini, Barry Austin. 00860
Union County, Slate Belt: Randazzo, Anthony F. 00866
North Dakota
Economic geology
Limestone, eastern, exploration, cement-rock possibilities: Anderson, Sidney B. 07051
Geophysical surveys
Canal sites, resistivity: Anzman, J. R. 06866
Hydrogeology
Cass County, ground-water resources, aquifers: Klausing, Robert L. 07043
Maps, geologic
Grand Forks County, cement-rock prospects: Anderson, Sidney B. 07051
Southwestern: Frye, Charles I. 00973
Maps, ground water
Cass County, availability: Klausing, Robert L. 07043
Stratigraphy
Cretaceous, Hell Creek Formation, members: Frye, Charles I. 00973
Mississippian, Kibbey Formation, Ray Member, Williston basin: Rawson, Richard R. 06973
Ordovician-Silurian, Pembina and Grand Forks Counties: Anderson, Sidney B. 07051
Northwest Territories
Absolute age
C-14, University of Wisconsin list: Bender, Margaret M. 00839
Economic geology
Petroleum, Arctic islands, potential: Hunt, A. D. 07081
Maps, magnetic
Franklin, Sheets 109 A:SE and NE, D:SE, airborne: Canada Geological Survey. 07122
Franklin, Sheets 109 A:SW and NW, D:SW, airborne: Canada Geological Survey. 07124
Franklin, Sheets 109 B:SE and NE, C:SE, airborne: Canada Geological Survey. 07126
Franklin, Sheets 109 B:SW and NW, C:SW, airborne: Canada Geological Survey. 07128
Franklin, Sheets 108 E:NE, H:SE, H:NE, airborne: Canada Geological Survey. 07121
Franklin, Sheets 108 E:NW, H:SW and NW, airborne: Canada Geological Survey. 07123
Franklin, Sheets 108 F:NE, G:SE and NE, airborne: Canada Geological Survey. 07125
Franklin, Sheets 108 F:NW, G:SW and NW, airborne: Canada Geological Survey. 07127
Northwest Territories
Maps, magnetic
Franklin, Sheets 98 G:SW and NW, 99 B:SW and NW, airborne: Canada Geological Survey. 0; 120
Sheets 105 O:9, O:16, airborne: Canada Geological Survey. 07106
Petrology
Muskox intrusion, quartz paramorphism: Pouliot, Gaston. 06930
Nova Scotia
Hydrogeology
Antigonish, alluvial aquifer, digital model: Trescott, Peter C. 00722
Nuclear explosions
Crustal studies
Nevada, test site region, symposium, 1966: Eckel, Edwin B. 06820
Deformation
Nevada, Yucca Flat, fault displacement: Dickey, D. D. 06814
Detection
Elastic-wave magnitudes, southwestern North America, Canadian data: Basham, P. W. 00932
Surface wave excitation, cf. earthquakes: Liebermann, Robert C. 00981
Fractures
Nevada, Yucca Flat, patterns: Barosh, Patrick J. 06813
Hydrogeology
Nevada, test site region, symposium, 1966: Eckel, Edwin B. 06820
Seismic effects
Benham explosion: Healy, John H. 00728
Ground motion, potential damage, evaluation: Stead, Frank W. 00727
Strain changes: McKeown, F. A. 00729
Ohio
Geomorphology
Lake Erie, south shore reef area, bottom and subsurface: Herdendorf, Charles E. 07088
Paleontology
Anthozoa, Devonian, Silica Formation, rugose fauna, n.spp.: Stumm, Erwin C. 06902
Crinoidea, Devonian, Silica Formation, archaeocrinid: Kesling, Robert V. 06941
Crinoidea, Devonian, Silica Formation, ontogeny: Kesling, Robert V. 06940
Sedimentary petrology
Lake Erie, south shore reef area, bottom sediments, cores: Herdendorf, Charles E. 07088
Oil and gas fields
California
Barham Ranch oil field: Wilkinson, Elbert R. 00964
Cheviot Hills field: Crowder, Robert E. 00943
Chico-Martinez oil field: Weddle, James R. 00944
East Temblor oil field: Land, P. E. 00961
Five Points oil field: Hill, F. L. 00962

Oil and gas fields
California
Hopper Canyon oil field: Dosch, Murray W. 00935
Long Beach oil field: Ingram, W. L. 00963
Tejon oil field, Southeast area: Barnes, J. A. 00965
Temblor Ranch oil field: Land, P. E. 00966
Wilmington oil field, offshore part, development: Szasz, S. E. 00920

Oil and gas wells
Wyoming
Iron Creek oil field, Natrona County: Dahill, Murray P. 06983

Oil sands
Alberta
Athabasca tar, reserves, potential: McClements, Robert, Jr. 07084

Oil shale
United States
Western, possibilities as liquid fuel: Katell, Sidney. 06846

Oklahoma
Maps, isopach
Nemaha Ridge, west flank, Cherokee Group, units: Berg, Orville Roger. 00828
Paleontology
Anthozoa, Pennsylvanian, favositid, n.gen.: Cocke, J. M. 06800
Stratigraphy
Pennsylvanian, Cherokee Group, Nemaha Ridges, west flank: Berg, Orville Roger. 00828

Ontario
Absolute age
C-14, ISOTOPES' list: Buckley, James D. 00834
Economic geology
Iron, Michipicoten district, genesis: Seguin, Maurice. 06926
Engineering geology
Landslides, Toronto area, Don Valley Parkway: Matich, M. A. J. 06962
Shorelines, Lake Erie, Port Bruce area, bluff erosion: Quigley, R. M. 07090
Geochemistry
Hydrothermal vein deposits, strontium, isotope ratios: Reesman, R. H. 06090

Optical mineralogy
Textbooks
Polarized light behavior, graphical representation: Wahlstrom, Ernest E. 00957

Ordovician
Maine
Western, Quimby–Greenvale Cove Formations: Moench, Robert H. 00773
Nevada
Arrow Canyon Range, Pogonip Group, algae: Pierce, R. W. 00816
Arrow Canyon Range, sedimentation: Stieglitz, Ronald D. 00787

Ordovician
New York
Champlain Valley, Trilobita, Chazy Group, correlation: Shaw, Frederick C. 07019
Northwestern, Trentonian Series, limestone units: Kay, Marshall. 06936
North Dakota
Grand Forks and Pembina Counties, stratigraphy: Anderson, Sidney B. 07051
Quebec
Gaspe, north shore, Graptolithina, zoning: Riva, John. 06937
Southwestern, "shale with blocks", Middle: Saint-Julien, Pierre. 06934
Vermont
Champlain Valley, Trilobita, Chazy Group, correlation: Shaw, Frederick C. 07019
Wisconsin
Champlainian Series, revision: Ostrom, Meredith E. 00751

Oregon
Absolute age
Cape Blanco area, marine terraces, C-14: Janda, Richard J. 00665
Klamath Mountains, plutons, metamorphic events, Nevadan orogeny: Lanphere, Marvin A. 00658
Geochemistry
Sixes River, geochemical prospecting, gold, size-grade relations: Boggs, Sam, Jr. 00695
Southwestern, Colebrook Schist, isotope data: Coleman, Robert G. 00703
Ultramafic rocks, secondary dolomite, genesis: O'Neil, James R. 00748
Geomorphology
Cape Blanco area, marine terraces, correlation: Janda, Richard J. 00665
Columbia River effluent system, sediment transport: Conomos, T. J. 00884
Continental shelf, sediment transport, processes: Harman, Robert A. 00915
Paleontology
Mammalia, Tertiary, Talpidae, taxonomy, morphology: Hutchison, J. Howard. 06922
Pelecypoda, Jurassic–Cretaceous, Myrtle Group, zonation: Jones, D. L. 00668
Petrology
Cascade Range, basalt welded tuff: Taylor, Edward M. 00795
Coast Range, central, sill, differentiation: MacLeod, Norman S. 00647
Greyback intrusive complex, contact aureole: Godchaux, M. M. 00682
Southwestern, Colebrook Schist: Coleman, Robert G. 00703
Sedimentary petrology
Central, Cretaceous conglomerate, plutonic clasts: Taubeneck, William H. 00794
Central, Cretaceous rocks, marine–continental facies: Oles, Keith F. 00633

Oregon
Sedimentary petrology
Central, Spotted Ridge Fm., granitic clasts: Taubeneck, William H. 00793
Elk River, pebbles, size-shape relations: Swanson, Frederick J. 00791
Stratigraphy
Eocene-Oligocene, central-western: McWilliams, Robert Gene. 00864
Tertiary, Columbia River Basalt, The Dalles: Holmgren, Dennis A. 00675
Structural geology
Southwestern, Colebrook Schist: Coleman, Robert G. 00703
Southwestern, Dothan and Rogue Fms., contact relations: Hotz, Preston E. 00663
Organic materials
Analytical data
Holocene sediments, Atlantic Ocean, northern, fatty acids: Cooper, W. J. 07059
X-ray diffraction patterns: Ergun, Sabri. 07012
Chlorophyll degradation products
Lake sediments, Lakes Erie, Ontario: Kemp, A. L. W. 07089
Fatty acids
Environment indicator, possible dating method: Das, Salil K. 07045
Geochemistry
X-ray diffraction analysis, interpretation: Ergun, Sabri. 07012
Humates
Sandstone, cement, New Mexico: Nash, J. Thomas. 06991
Hydrocarbons
California, Mono Basin, sediments: Reed, Walter E. 00783
Lipids
Environment indicator, possible dating method: Das, Salil K. 07045
Microstructure
Meteorites, biogenic and indigenous nature: Claus, George. 06954
Orogeny
Absolute age
California, Oregon, Klamath Mts., Nevadan: Lanphere, Marvin A. 00658
Appalachian
Tennessee, Saltville fault: Smith, James William. 00871
Ostracoda
Campylocytherinae
Cenozoic, selected genera, morphology: Plusquellec, Paul Lloyd. 00865
Pacific Ocean
Geophysical surveys
Aleutian trench area, fracture zones, magnetic: Grim, Paul J. 00924
Bering Sea, review: Stone, D. B. 07062
Eastern, off central California, magnetic: Bassinger, B. G. 00923
Petrology
Northeastern, seamount, basalts: Nayudu, Y. R. 00638
Pacific Ocean
Sedimentary petrology
La Jolla, San Lucas deep-sea fan valleys: Normark, W. R. 00642
Structural geology
Aleutian Islands area, fracture zones, south of trench: Grim, Paul J. 00924
Juan de Fuca Ridge, sea-floor spreading, evidence: Duncan, John R. 00723
Paleobotany
Cretaceous
Alaska, Nanushuk and Colville Groups, northern: Smiley, Charles J. 00779
Paleoclimatology
Indicators
Stream sediments, placers: Krook, Leendert. 06980
Quaternary
Pleistocene ice lags, evidence: Kemp, W. C. 00940
Temperature
Pleistocene ice lags, evidence: Kemp, W. C. 00940
Paleoecology
Algae
Reducing environment, fatty acids: Das, Salil K. 07045
Analysis
Faunal mixing, seaweed transportation, significance: Lovenburg, Mervin F. 00645
Diatoms
Quaternary, Lake Huron, core assemblage, distribution: Stoermer, E. F. 07085
Foraminifera
Anaerobic basin, California, Santa Barbara basin: Berger, Wolfgang H. 00894
Indicators
Geochemical-faunal analyses, California, Pliocene-Pleistocene: Stanton, Robert J. 00786
Mammalia
Oligocene-Holocene, horses, manus osteology, evolution: Sondaar, P. Y. 07006
Sedimentation
Clay-mineral analysis, Jurassic, Wyoming: Furlong, Robert B. 06946
Vertebrata
Pliocene, fluvial-terrestrial, Kansas: Wilson, Richard Leland. 06938
Paleogeography
Cretaceous
Texas, central: Boone, Peter A. 07066
New York
Precambrian to Holocene, New York City region: Schuberth, Christopher J. 06968
Paleozoic
Gulf of Saint Lawrence region, cf. Europe: Dineley, D. L. 07016
Paleomagnetism
Permian
Colorado Plateau, red beds: Farrell, W. E. 00925
Pole positions
Eocene, North America: Larson, E. E. 00926

Paleomagnetism
Pole positions
Wandering curves, North America, Europe, interpretation: Hospers, J. 07064
Quaternary
Hawaii, lava, secular variations, Holocene: Doell, Richard R. 00714
Tertiary
Nevada, volcanics, Nevada Test Site, relation to magnetic anomalies: Bath, Gordon D. 06806
Paleontology
Environmental analyses
Geochemical analysis, invertebrates, California, Pliocene–Pleistocene: Stanton, Robert J. 00786
Paleozoic
Arkansas
Coal Hill, Hartman, Clarksville quadrangles: Merewether, E. A. 00976
British Columbia
Upper, Atlin horst, stratigraphy: Monger, J. W. H. 00654
Central America
Northern, tectonic history, sedimentation: Dengo, Gabriel. 00770
Colorado
Slick Rock district, stratigraphy: Shawe, Daniel R. 07018
Mexico
Yucatan Peninsula, basement rocks: Bass, M. N. 00730
Nevada
Snake Mountains, northern, thrust sequences: Gardner, Douglas Hanson. 00861
Thickness and distribution, southern: Ekren, E. B. 06822
Pennsylvania
Southern Anthracite field: Wood, Gordon H., Jr. 00756
Washington
Cascade Mountains, southern, history: Ellingson, Jack A. 00694
Yukon
Upper, Atlin horst, stratigraphy: Monger, J. W. H. 00654
Panama
Absolute age
C-14, UCLA list: Berger, Rainer. 00823
Pebbles
Oregon
Elk River, size–shape relations: Swanson, Frederick J. 00791
Pelecypoda
Buchia
Jurassic–Cretaceous, Oregon, Myrtle Group, zones: Jones, D. L. 00668
Mactridae
Cretaceous, evolution: Saul, LouElla R. 00813
Pennsylvania
Areal geology
Southern Anthracite field: Wood, Gordon H., Jr. 00756
Pennsylvania
Economic geology
Coal, general, review: Edmunds, William E. 07076
Engineering geology
Shorelines, Lake Erie, stabilization: Berg, Dennis W. 07009
Waste disposal, coal mine waters: Stefanko, Robert. 06858
Geochemistry
Stream sediments, geochemical prospecting, heavy metals: Rose, A. W. 06854
Maps, geologic
Portland quadrangle: Drake, Avery Ala, Jr. 00950
Maps, tectonic
Southern Anthracite field: Wood, Gordon H., Jr. 00756
Stratigraphy
Portland quadrangle, sections: Drake, Avery Ala, Jr. 00950
Pennsylvanian
Indiana
Classification: Wier, Charles E. 06916
Kansas
Anthozoa, Desmoinesian–Missourian, favositid: Cocke, J. M. 06800
Montana
Fergus County, Pisces, Bear Gulch Fm.: Melton, William G. 00650
Oklahoma
Anthozoa, Desmoinesian–Missourian, favositid: Cocke, J. M. 06800
Nemaha Ridge, west flank, Cherokee Group: Berg, Orville Roger. 00828
Oregon
Central, Spotted Ridge Fm., granitic clasts: Taubeneck, William H. 00793
Pennsylvania
Coal-bearing rocks, general: Edmunds, William E. 07076
Permeability
Sandstone
New Mexico, Jackpile formation: Nash, J. Thomas. 06991
Permian
Nevada
Northeastern, Arcturus and Park City Groups, biostratigraphy: Collinson, James W. 06949
United States
Colorado Plateau, paleomagnetism: Farrell, W. E. 00925
Petrofabrics
Methods
X-ray diffraction analysis: Chakrabarti, A. K. 00699
Petroleum
Alberta
Northeastern, Senex discovery, reserve potential: Gagnon, Paul M. 00822
Bering Sea
Possibilities, exploration: Hopkins, D. M. 06844

Petroleum
California
Barham Ranch field, possibilities: Wilkinson, Elbert R. 00964
Cheviot Hills field, occurrence: Crowder, Robert E. 00943
Chico–Martinez field, occurrence, Etchegoin sands: Weddle, James R. 00944
East Temblor field, occurrence, Phacoides Sandstone: Land, P. E. 00961
Five Points field, occurrence, Domengine sand: Hill, F. L. 00962
Hopper Canyon field, occurrence, Modelo Fm.: Dosch, Murray W. 00935
Long Beach field, production, Puente and Repetto Fms.: Ingram, W. L. 00963
Tejon field, Southeast area, occurrence: Barnes, J. A. 00965
Temblor Ranch field, occurrence, Phacoides Sandstone: Land, P. E. 00966
Wilmington field, offshore part, occurrence, development: Szasz, S. E. 00920
Canada
Reserves and potential: Sproule, J. C. 07056
Resources, general: Hilborn, James D. 07079
Western, exploration history: Sproule, J. C. 07080
Western, reserves, 1967: Connell, Gordon A. 07083
Experimental studies
Retention by clay-containing sandstone: Reed, M. G. 07029
Exploration
Reservoir location and productivity, Log-Test-Log drill stem test: Powell, A. R. 07004
Seismic methods, Mexico: FragaPurata, Jorge A. 07020
Stratigraphic traps, general: Dix, C. H. 00901
Illinois
Map of fields, 1968: Meents, Wayne F. 06799
Kentucky
Graham quadrangle, occurrence: Kehn, Thomas M. 07013
Northwest Territories
Arctic islands, potential: Hunt, A. D. 07081
Production
Development, impact of government policies: Heitman, George. 06841
Reservoirs
Evaporite-solution brecciation in reef-bank carbonates, Canada: Beales, F. W. 00780
Wyoming
Casper area, Iron Creek field, occurrence, production: Dahill, Murray P. 06983
Wind River basin, sulfur isotopes, fractionation: Vredenburgh, Larry Dale. 00874

Phase equilibria
Coesite–stishovite
Transition curve: Akimoto, Syun-iti. 00985
Fe–C–O–S + H_2O
Application to iron formations, Ontario, Labrador: Seguin, Maurice. 06926
Experimental results: Seguin, Maurice. 06925

Phase equilibria
Zn–Fe–S
Experimental studies: Chernyshev, L. V. 06979
Experimental studies: Einaudi, Marco T. 06976

Phosphate
Utah
Causey Dam quadrangle, occurrence: Mullens, Thomas E. 00824

Photogeology
Applications
Coal mining, exploration and production: Carmichael, V. W. 06869
Interpretation
Arizona, lineations, Gemini and Apollo photos: Lintz, Joseph, Jr. 00661

Pisces
Caranx sp.
Miocene, California, Sharktooth Hill, dorsal-fin hyperostoses: Fierstine, Harry L. 06801
Morphology
Carangidae, hyperostoses of dorsal-fin base: Fierstine, Harry L. 06801
Pennsylvanian
Montana, Bear Gulch Fm.: Melton, William G. 00650
Quaternary
California, San Pedro, Timms Point silt, Pleistocene, otoliths: Fitch, John Edgar. 06804
Quebec
Devonian, Battery Point Formation, Gaspe Peninsula: Pageau, Yvon. 06906
Tertiary
California, Kern County, Miocene sharks: Bishop, Richard C. 00708
California, Temblor–Monterey Formations, Miocene: Bacskai, Judith A. 00676

Placers
Genesis
Flood scour: Krook, Leendert. 06980

Polymetallic ores
Exploration
Electromagnetic prospecting, inductive, instrumentation: Alexander, Paul B. 06984
Tennessee
Ducktown, genesis, metamorphism: Salotti, C. A. 06856
Utah
Star district, Old Moscow mine, genesis: Abou-Zied, Mohamed Saleh. 00856

Popular and elementary geology
Appalachians
General: Connelly, Thomas L. 06969
Coal
Pennsylvania, occurrence, production, reserves: Edmunds, William E. 07076
Meteorites
Michigan falls: Chamberlain, Von Del. 06970

Precambrian
Absolute age
Basement rocks, Utah: Stacey, J. S. 06945

Precambrian
Colorado
Needle Mountains, absolute age: Bickford, M. E. 00986
Unaweep Canyon, absolute age: Mose, Douglas, G. 00987
Montana
Jardine–Crevice Mountain area, absolute age: Brookins, Douglas G. 06974
Nevada
Ruby Mountains, Cambrian boundary: Kistler, Ronald W. 00655
Protista
Morphology
Tunisphaeridium, Silurian, quantitative analysis of species: Deunff, Jean. 06923
Tunisphaeridium n.gen.
Silurian, New York, western, Maplewood Shale, n.spp.: Deunff, Jean. 06923
Pteridophytes
Annularia
Eocene, Alaska, Adak Island: Scholl, David W. 00906
Quaternary
Alabama
Conecuh County, stratigraphy: Reed, Philip C. 07050
Alaska
Brooks Range, central, glacial history: Hamilton, Thomas D. 00687
California
Rancho La Brea, Mammalia, bison, camel: Miller, Wade E. 06900
Sacramento area, alluvium, absolute age: Shlemon, Roy J. 00784
San Pablo Bay, terrace deposits, Pleistocene: Williams, C. Thomas. 00807
San Pedro, Pisces, Timms Point silt, Pleistocene: Fitch, John Edgar. 06804
Continental margin
California, Pleistocene sea–level changes, effect: Dill, Robert F. 00919
Great Lakes region
Lake Huron, diatoms, core assemblage, distribution: Stoermer, E. F. 07085
Mexico
Yucatan shelf, coral reef growth: Logan, Brian W. 00764
Nevada
Lincoln County, Mammalia, cave deposits: Jefferson, G. T. 00666
Quebec
Invertebrata, marine, check list: Wagner, Frances J. E. 06905
Lake Saint Jean area, Invertebrata, post–glacial submergence: Dionne, Jean–Claude. 06904
South Dakota
Bennett, Walworth, Lincoln Counties, Mammalia, Pleistocene, muskrats: Harksen, J. C. 06895
Washington
Mount Adams, glacial deposits, volcanics: Hopkins, Kenneth D. 00628
Quaternary
Washington
Point Roberts, interglacial sequence: Danner, Wilbert R. 00692
West Indies
Bonaire, limestone cap, coral reefs: Zonneveld, J. I. S. 07046
Quebec
Absolute age
Manicouagan River valley, barnacle in clay, C–14: Sauve, Pierre. 06931
Geochemistry
Quemont mine, sphalerite composition: Campbell, F. A. 06975
Geomorphology
Lake Saint Jean area, post–glacial submergence: Dionne, Jean–Claude. 06904
Landslides, mud–flow type: Chagnon, Jean–Y. 06933
Glacial geology
Chattermarks, types: Laverdiere, Camille. 07002
Manicouagan River valley, ice stagnation, fluvioglacial material: Sauve, Pierre. 06931
Paleontology
Graptolithina, Ordovician, Middle, Gaspe north shore: Riva, John. 06937
Invertebrata, Quaternary, check list, marine: Wagner, Frances J. E. 06905
Invertebrata, Quaternary, marine beds, Lake St. Jean area: Dionne, Jean–Claude. 06904
Pisces, Devonian, Battery Point Formation, Gaspe Bay: Pageau, Yvon. 06906
Petrology
Brome Mountain, Brome igneous complex: Valiquette, Guy. 06929
Shawinigan Complex, anorthosite, genesis: Martignole, Jacques. 06927
Sedimentary petrology
Rimouski area, Ordovician flysch, sandstones, diagenetic effects: Lajoie, Jean. 06928
Stratigraphy
Devonian, Gaspe Sandstones, Gaspe Peninsula: Pageau, Yvon. 06906
Ordovician, Middle, biostratigraphy: Riva, John. 06937
Ordovician, Middle, "shale with blocks", southwestern: Saint–Julien, Pierre. 06934
Structural geology
Southwestern, overthrusts, Sillery klippe: Saint–Julien, Pierre. 06934
Weathering
Saint Hyacinthe County, St. Jude soil, minerals: Ledoux, Robert. 06932
Radioactivity
Comagmatic rocks
Variations, correlation with differentiation: Tilling, Robert I. 00731
Radioactivity methods
Techniques
Gamma–ray spectrometry: Adams, J. A. S. 06826

Radiolaria
Prunopyle titan
Miocene, deep-sea cores and California, stratigraphic limits: Bandy, Orville L. 00882
Rare earths
Abundance
Volcanics, tephrachronology: Goles, G. G. 00683
Reefs
Gulf of Mexico
Quaternary, Yucatan shelf: Logan, Brian W. 00771
Lake Erie
Western, south shore, bedrock topography: Herdendorf, Charles E. 07088
Mexico
Holocene, Yucatan shelf: Logan, Brian W. 00764
Remote-sensing methods
Applications
Mineral exploration: Reeves, R. G. 06883
Reptilia
Tertiary
California, Mojave Desert: Whistler, David P. 00804
Kansas, Trego County, WaKeeney local fauna: Wilson, Richard Leland. 06938
Rivers
Erosion
Placers, gold: Krook, Leendert. 06980
South Dakota
Box Elder Creek, water losses and gains, limestone sinks: Crooks, Thomas Jm 06889
Salt
Utah
Great Salt Lake, brine composition, production: Straesser, Manfred. 06993
Sea water
Geochemistry
Cambrian, dolomite precipitation: Kepper, John C. 00629
Seamounts
Pacific Ocean
Northeastern, petrology, bathymetry: Nayudu, Y. R. 00638
Sedimentary rocks
Carbonate rocks
Alteration, dolomitization, Bahamas, Andros Island : Goodell, H. G. 00781
Clay
Mineral composition, genesis, Washington, Spokane County: Hosterman, J. W. 00825
Conglomerate
Petrology, Oregon, Spotted Ridge Fm., granitic clasts: Taubeneck, William H. 00793
Petrology, provenance, plutonic clasts, Oregon: Taubeneck, William H. 00794
Dolomite
Alteration, Superior test well, Bahamas, Andros Island: Goodell, H. G. 00781
Genesis, precipitation on sea-floor, Cambrian: Kepper, John C. 00629
Sedimentary rocks
General
General description, Washington, Cascade Mts., Paleozoic history: Ellingson, Jack A. 00694
Provenance, lower Tertiary, California, Santa Cruz Is.: Merschat, Walter R. 00910
Graywacke
Genesis, experimental study: Hawkins, James W., Jr. 00671
Lithofacies
Alaska, southeastern, Silurian-Devonian clastic wedge: Ovenshine, A. Thomas. 00634
British Columbia, Charlie Lake Fm., Boundary Member: Roy, Kenneth James. 00868
British Columbia, Nanaimo Group: Muller, J. E. 00631
Montana-North Dakota, Kibbey Formation, Ray Member: Rawson, Richard R. 06973
Nevada, Arrow Canyon Range, Ordovician-Silurian: Stieglitz, Ronald D. 00787
Nevada, Snake Mountains, thrust sequences: Gardner, Douglas Hanson. 00861
North Carolina, South Carolina, Black Creek Fm.: Benson, Paul Harrison, 3d. 00858
Oregon, central, Cretaceous: Oles, Keith F. 00633
Manganese-rich
Mineral composition: Roy, Supriya. 06986
Sandstone
Diagenesis, turbidites, effect on matrix, Quebec: Lajoie, Jean. 06928
Petrology, Morrison Formation, New Mexico: Nash, J. Thomas. 06991
Shale
Provenance, mineral composition, Morrison, Kootenai Fms., Montana: Suttner, Lee J. 06947
Structural features, California, Meganos gorge fill, compaction: Edmondson, William F. 00914
Sedimentary structures
General
California, Santa Cruz Island, Tertiary sediments, lower: Merschat, Walter R. 00910
California, Sespe Formation, Ventura basin: McCracken, Willard A. 00881
Washington, Point Roberts, interglacial sequence: Danner, Wilbert R. 00692
Interpretation
Alaska, southeastern, Silurian-Devonian clastic wedge: Ovenshine, A. Thomas. 00634
Nevada, Arrow Canyon Range, Ordovician-Silurian: Stieglitz, Ronald D. 00787
North Carolina, South Carolina, Black Creek Fm.: Benson, Paul Harrison, 3d. 00858
Utah, Navajo Sandstone, regional variations: Marzolf, John. 00648

Sedimentation
Environment
Anaerobic basin, foram preservation, California: Berger, Wolfgang H. 00894
Coast, Columbia River effluent system: Conomos, T. J. 00884
Continental slope, effects of Pleistocene sea-level changes: Dill, Robert F. 00919
Lacustrine, Ohio, Lake Erie, south shore reef area: Herdendorf, Charles E. 07088
Ocean, California, Santa Barbara basin: Soutar, Andrew. 00893
Tidal flat, Gulf of California, Colorado River delta: Thompson, Robert Wayne. 07021
Experimental studies
Shoreline stabilization, Pennsylvania, Lake Erie: Berg, Dennis W. 07009
Ocean currents
Sand transport, shoaling-wave area, California: Cook, David O. 00883
Sediment transport, near shore, computer simulation: Bonham-Carter, Graeme F. 00885
Rates
California, Mono basin: Gilbert, C. M. 00690
Sediments
Absolute age
California, Sacramento area, Riverbank Fm.: Shlemon, Roy J. 00784
Alluvium
General description, Nevada, Yucca Flats area, Cenozoic: Fernald, Arthur T. 06825
Carbonate
General description, Mexico, Yucatan shelf: Logan, Brian W. 00763
General description, Mexico, Yucatan shelf: Logan, Brian W. 00771
Geochemistry, Ca, Mg, Sr dissolution, biogenic: Schroeder, Johannes Herbert. 00870
Diagenesis
Lakes Erie, Ontario, chlorophyll degradation products: Kemp, A. L. W. 07089
Environment
Continental margin, Washington-Oregon, distribution process: Harman, Robert Am 00915
General
Atlantic Ocean, Glomar Challenger drilling program: Field, A. J. 00905
Fabric analysis, variance analysis, Washington offshore: Kelley, James C. 00917
Mineral composition, Caribbean Sea: Griffin, John J. 00767
Provenance, California, Santa Cruz basin: Barnes, Peter W. 00913
Size analysis, mineral composition, continental shelf, Washington: Venkatarathnam, K. 00912
Geochemistry
Atlantic Ocean, northern, Holocene, fatty acids: Cooper, W. J. 07059
California, Mono Basin, hydrocarbons: Reed, Walter E. 00783
Sediments
Geochemistry
Lakes, ferrous iron, analysis method, Lake Erie: Ross, Curtis. 07093
Lithofacies
Gulf of California, Colorado River delta, tidal flat: Thompson, Robert Wayne. 07021
Lake Michigan, southwestern: Somers, Lee H. 07091
Ohio, Lake Erie, south shore reef area: Herdendorf, Charles E. 07088
Methods
Density sampling, alluvium, evaluation: Prokopovich, Nikola P. 00818
Samplers, suspended detritus in sea water: Folger, D. W. 06992
Physical properties
California, Mono basin: Gilbert, C. M. 00690
Provenance
Caribbean Sea: Griffin, John J. 00767
Sand
Fabric analysis, fine sands, dry-stable aggregate analysis: Volk, G. M. 06963
Size analysis, aerodynamic method: Skaggs, R. W. 06899
Seismic methods
Acoustical
Application, marine engineering projects: Palmer, H. D. 06882
Application
Near surface materials: Murphy, V. J. 06880
Applications
Overburden studies: Cooksley, James W. 06870
Petroleum exploration, Mexico: FragaPurata, Jorge A. 07020
Quarry sites, problem areas detection: Lutzen, E. E. 06847
Automatic data processing
Continuous reflection parameter determination, application: Carter, Melvan D. 00899
Instruments
Seismograph, light-weight, portable: Greene, H. Gary. 00902
Interpretation
Offshore data, advances: Hughes, Judson B., Jr. 00921
Techniques
Conversion of data, time to depth coordinates: Hornsby, James M. 00900
Glacier ice, P-wave velocity calculation: Ruter, H. 06957
Transit sonar, lake-bottom sediments: Donato, R. J. 07087
Seismic surveys
Alaska
Nome area, gold placers: Greene, H. Gary. 00902
Caribbean Sea
Bartlett Trough, western: Banks, Norman G. 00754

Seismic surveys
Continental margin
Oregon shelf, structure: Bales, William E. 00903
Oregon, structure, southern, central: Kulm, L. D. 00904
Great Lakes region
Lake Ontario, Niagara area, sediments, transit sonar: Donato, R. J. 07087
Greenland
Central icecap, reflection, upper layer properties: Brockamp, B. 06956
Pacific Ocean
Northeastern, Pioneer Fracture-Delgada Fan intersection: Winterer, E. L. 07061
United States
Maryland-Delaware-Virginia, submarine canyons: Uchupi, Elazar. 07060
Western, crustal structure: Claus, Prodehl. 00726
Seismology
Elastic waves
Diffracted, P, SV, SH, shadow boundary shifts: Teng, Ta-Liang. 00927
Phase and group slowness, inhomogeneous mediums: Knopff, Leon. 0098
P-waves, amplitudes near core-shadow boundary: Phinney, Robert A. 00991
Surface, excitation by earthquakes, explosions: Liebermann, Robert C. 00981
Shorelines
Changes
Alaska, Montague Island, 1964 earthquake effects: Kirkby, M. J. 00977
Evolution
West Indies, Bonaire: Zonneveld, J. I. S. 07046
Silurian
Alaska
Southeastern, clastic wedge, sedimentation: Ovenshine, A. Thomas. 00634
Southeastern, conodonts: Ovenshine, A. Thomas. 00635
Illinois
Chicago area, Anthozoa, Niagaran dolomite: Stumm, Erwin C. 06898
Nevada
Arrow Canyon Range, sedimentation: Stieglitz, Ronald D. 00787
New York
Western, Protista, new acritarchs, Maplewood Shale: Deunff, Jean. 06923
North Dakota
Grand Forks and Pembina Counties, stratigraphy: Anderson, Sidney B. 07051
Silver
Nevada
Nellis Air Force range, occurrence: Ekren, E. B. 06822
South Dakota
Trojan area, Bald Mtn. mine tailings, analysis: Fredlund, Daniel A. 06994
Soils
Engineering properties
Anisotropic clays, undrained strength and pore-water pressures: Duncan, J. M. 07044
Strength anisotropy, Mohr-Coulomb theory: Baker, Wallace Hayward. 00878
Florida
Okeechobee County, genesis, deep profile studies: Fiskell, J. G. A. 06950
Ona and Leon fine sands, aggregation of mineral and organic matter: Volk, G. M. 06963
Western, Magnolia and Greenville, genesis, analyses: Caldwell, R. E. 06951
Western, Marlboro and Faceville, genesis, analyses: Dantzman, C. L. 06964
Genesis
Florida, Okeechobee County, deep profile studies: Fiskell, J. G. A. 06950
Indiana
South-central, Pembroke soils, clay mineralogy, quantitative analysis: Post, Donald F. 06919
South-central, Pembroke soils, clay-mineral composition, changes: Post, Donald F. 06903
Mineralogy
Clay minerals, quantitative analysis, methods: Post, Donald F. 06919
Quebec
Saint Hyacinthe County, St. Jude soil, mineral composition: Ledoux, Robert. 06932
South Carolina
Engineering geology
Radioactive waste disposal, Savannah River Plant: Reichert, S. O. 06887
Sedimentary petrology
Black Creek Formation, depositional environments: Benson, Paul Harrison, 3d. 00858
South Dakota
Economic geology
Gold and silver, Trojan area, Bald Mtn. mine tailings, analysis: Fredlund, Daniel A. 06994
Mineral resources, Black Hills, Ingersoll and Tin Mtn., mine dumps: Roberts, W. L. 06893
Tungsten, Harney Peak dome, southwestern, genesis: Kernaghan, James S. 06891
Geochemistry
Eastern, ground-water pH, field and laboratory determinations, differences: Lufkin, Nat. 06995
Hydrogeology
Big Sioux aquifer system, stream discharge measurements: Ackroyd, Earl A. 06996
Black Hills, Box Elder Creek, water losses and gains, limestone sinks: Crooks, Thomas J. 06889
Black Hills, east side, aquifer recharge from stream losses to caverns: Gries, John Paul. 06890

South Dakota
Hydrogeology
Eastern, ground-water pH, field and laboratory determinations, differences: Lufkin, Nat. 06995
Sioux Falls area, new aquifer: Vaughan, Kenneth D. 06892
Southeastern, Choteau aquifer, analog model and analyzer study: Kume, Jack. 06998
Mineralogy
Black Hills, Ingersoll and Tin Mtn. mine dumps: Roberts, W. L. 06893
Paleontology
Mammalia, Miocene, Sharps Formation, southwestern, entelodont: Green, Morton. 07000
Mammalia, Pleistocene, South Dakota, Bennett, Walworth, Lincoln Counties, muskrats: Harksen, J. C. 06895
Vertebrata, Oligocene, Brule Fm., Slim Buttes: Lillegraven, Jason A. 00659
Petrology
Harney Peak dome, southwestern, metamorphic rocks: Kernaghan, James S. 06891
Stratigraphy
Oligocene, Brule Fm., Slim Buttes: Lillegraven, Jason A. 00659
Spectroscopy
Mossbauer effect
Layer silicates, iron analysis: Taylor, G. L. 06960
X-ray fluorescence
Clay, potassium content determination: Johnson, Leon J. 06959
Springs
Geochemical prospecting
Wisconsin, zinc: DeGeoffroy, J. 06944
Missouri
Ozark Mountains, Hurricane Creek basin, relation to karst watershed: Aley, Thomas. 07052
South Dakota
Black Hills, Box Elder Creek, connection with sinkholes: Crooks, Thomas J. 06889
Statistical methods
Economc geology
Trend-surface analysis, geochemical prospecting: DeGeoffroy, J. 06944
Engineering geology
Regression analysis, Nevada Test Site, granitic rock, properties: Ege, John R. 06812
Sedimentary petrology
Regression analysis, pebbles, size-shape relations, Oregon: Swanson, Frederick J. 00791
Variance analysis, sediment textures, Washington: Kelley, James C. 00917
Stocks
Absolute age
Nevada, Tenabo area: Silberman, M. L. 00809
Nevada
Copper Canyon stock, halo, geochemistry: Theodore, Ted G. 00796
Stocks
Nevada
Yucca Flat area, Mesozoic: Hinrichs, E. Neal. 06794
Strontium
Abundance
Barite, marine vs. continental: Goldberg, Edward D. 00760
Isotopes
Barite, marine vs. continental: Goldberg, Edward D. 00760
Ratios, vein deposits: Reesman, R. H. 06990
Ratios, volcanics, Wyoming: Peterman, Zell E. 00821
Structural geology
Applications
Faults, mineral exploration: Stokes, William Lee. 06985
Ore exploration, fractures, domes, intersections: Wertz, J. B. 06860
Ore exploration, orogenic belts: Brown, Severn P. 06832
Sulfur
Canada
Western, reserves, 1967: Connell, Gordon A. 07083
Geochemistry
System Zn-Fe-S: Campbell, F. A. 06975
System Zn-Fe-S: Chernyshev, L. V. 06979
System Zn-Fe-S: Einaudi, Marco T. 06976
Thermal springs, bacterial origin of sulfuric acid: Schoen, R. 06897
Isotopes
Barite, marine vs. continental: Goldberg, Edward D. 00760
Petroleum, Wyoming, Wind River basin: Vredenburgh, Larry Dale. 00874
Surveys
Canada Geological Survey
History, service to oil industry: Belyea, H. R. 07082
United States Geological Survey
Water resources investigations, techniques, 1966-67: Chase, Edith Becker. 07031
Symposia
U.S.-Japan Cooperative Science Program
Conference, earthquake prediction, 1968: Oliver, Jack. 00931
Tectonics
Areal studies
California, cf. Sakhalin, Hokkaido, Taiwan, Cenozoic: Melankholina, Ye. N. 07026
California, Channel Islands: Yeats, Robert S. 00908
California, Santa Lucia Range, relations to sea-floor spreading: Page, Ben M. 00632
California, western, Mesozoic: Lowe, Donald R. 00646
Caribbean region, Bay Islands, recent uplift: McBirney, Alexander R. 00765
Central America, northern, history: Dengo, Gabriel. 00770
Gulf Coastal Plain, tensional spreading vs. tectonic denudation: Cloos, Ernst. 00758

Tectonics
Areal studies
Pacific Ocean, Juan de Fuca Ridge, sea-floor spreading: Duncan, John R. 00723
Tennessee, Saltville fault: Smith, James William. 00871
Processes
Energy sources, convection vs. phase change: Carr, Jerome B. 07001
Island arcs, evolution: Baker, P. E. 07014
Mantle convection: Turcotte, D. L. 00922
Sea-floor spreading, Atlantic Ocean, underthrust of Antilles: Chase, Richard L. 00928
Sea-floor spreading, undeformed sediments in trenches, explanation: Seyfert, Carl K. 00949
Strain, Earth's surface, extensometer for observation: Vali, V. 07055
Tensional spreading vs. tectonic denudation: Cloos, Ernst. 00758
Tektites
Composition
Water content, infrared analysis: Gilchrist, J. 00934
Tennessee
Economic geology
Clays, western, occurrence, properties: Olive, Wilds W. 00753
Polymetallic ores, Ducktown, genesis: Salotti, C. A. 06856
Geochemistry
Stream sediments, geochemical prospecting, lead-zinc: Carpenter, R. H. 06834
Petrology
Great Smoky Mountains, Thunderhead Sandstone, metamorphism: Allen, Gary Curtiss. 00857
Structural geology
Mooresburg area, Saltville fault: Smith, James William. 00871
Tertiary
Alabama
Conecuh County, stratigraphy: Reed, Philip C. 07050
Alaska
Adak Island, *Annularia*-bearing beds, Eocene: Scholl, David W. 00906
Atlantic Coastal Plain
New Jersey, Delaware, Maryland, Cretaceous boundary: Minard, James P. 00752
California
Channel Islands, Paleogene sequence: Doerner, David. 00895
Correlation, middle stages with tropical planktonic zones: Bandy, Orville L. 00892
Foraminifera, planktonic indices cf. Italy, Pliocene: Bandy, Orville L. 00887
Garrett Tunnel area, stratigraphy, structural relations: Berkland, James O. 00706
Kern County, Mammalia, Miocene: Barnes, Lawrence G. 00709
Kern County, Pisces, Miocene: Bishop, Richard C. 00708
Tertiary
California
Laguna Hills, Aves, Miocene(?) fauna: Howard, Hildegarde. 06803
Mojave Desert, Reptilia: Whistler, David P. 00804
Pisces, Temblor-Monterey Formations, Miocene: Bacskai, Judith A. 00676
Santa Cruz Island, lower, paleocurrents: Merschat, Walter R. 00910
Santa Cruz Island, Miocene biostratigraphy: Bereskin, S. Robert. 00896
Santa Cruz Mountains, Mollusca, Merced(?) Formation: Addicott, W. O. 00711
Santa Monica Mountains, Miocene volcanics: Blackerby, Bruce A. 00909
Sharktooth Hill, Miocene, Pisces, carangid: Fierstine, Harry L. 06801
Warner Mountains, Cedarville Series: Hulbe, C. W. H. 00664
Colorado
Spanish Peaks, Eocene, dikes, magnetic properties: Larson, E. E. 00926
Continental margin
Oregon, biostratigraphy, paleoecology: Fowler, Gerald A. 00891
Foraminifera
Paleogene, lineage genera classification: Steineck, P. Lewis. 00886
Kansas
Trego County, Vertebrata, Pliocene, WaKeeney local fauna: Wilson, Richard Leland. 06938
Mammalia
Hyracodon, dentition, evolution: Hanson, C. Bruce. 06997
Montana
Beaverhead River Basin, Bozeman Group: Petkewich, Richard M. 00782
Granite-Powell Counties, Cabbage Patch beds, correlation: Fields, Robert W. 00681
Nevada
Lincoln County, Kane Wash Tuff: Noble, Donald C. 06818
Nye and Esmeralda Counties, volcanics, K-Ar ages: Kistler, Ronald W. 06796
Nye County, Silent Canyon caldera, Belted Range Tuff, Miocene: Noble, Donald C. 06808
Pahute Mesa, Silent Canyon volcanics: Orkild, Paul P. 06815
Southern, Timber Mountain Tuff: Byers, F. M., Jr. 06816
Southern, volcanics: Ekren, E. B. 06822
Southern, volcanics, fault systems, age: Ekren, E. B. 06795
New Mexico
San Juan basin, Mammalia, Nacimiento Fm., Paleocene: Gazin, C. Lewis. 07024
Shiprock, Eocene dikes, magnetic properties: Larson, E. E. 00926
North America
Mammalia, sloths, geographic distribution, Pliocene: Hirschfield, Sue Ellen. 00673

Tertiary
Oregon
Central–western, Eocene–Oligocene units: McWilliams, Robert Gene. 00864
Mammalia, Talpidae: Hutchison, J. Howard. 06922
The Dalles, Columbia River Basalt: Holmgren, Dennis A. 00675
South Dakota
Slim Buttes, Brule Fm., Vertebrata: Lillegraven, Jason A. 00659
Southwestern, Mammalia, Sharps Formation: Green, Morton. 07000
Utah
Powder Wash site, Green River Formation, Mammalia, Eocene: Burke, J. J. 00847
Washington
Yakima area, Columbia River Basalt: Holmgren, Dennis A. 00675
Yakima County, Mammalia, Ellensburg Formation: Bryant, Laurie J. 06802
Texas
Economic geology
Uranium, Coastal Plain, genesis: Eargle, D. Hoye. 00971
Hydrogeology
Delaware basin, saline-water data, computer program: Hiss, William L. 00719
Stratigraphy
Cretaceous, Trinity sands, central: Boone, Peter A. 07066
Thermal springs
California
Coso Hot Springs, mercury, occurrence: Koenig, James B. 00656
United States
Sulfuric acid, bacterial origin, western: Schoen, R. 06897
Thorium
Abundance
Barite, marine vs. continental: Goldberg, Edward D. 00760
Trace-element analyses
Carbonaceous chondrites
Cr, Mn, X-ray fluorescence: Yates, Ann M. 06999
Diabase
North Carolina Piedmont: Ragland, Paul C. 07069
Sphalerite
Quebec, electron microprobe: Campbell, F. A. 06975
Sulfide schists
Canada: Boyle, R. W. 06978
Water
Lake Erie, chemical composition: Weiler, R. R. 07094
Triassic
British Columbia
Northeastern, Charlie Lake Fm., Boundary Member: Roy, Kenneth James. 00868
Colorado
North-central, Chinle Formation: Pipiringos, G. N. 00774
Triassic
Nevada
Northeastern, Thaynes Formation, biostratigraphy: Collinson, James W. 06949
North Carolina
Piedmont, diabase dikes: Ragland, Paul C. 07069
Utah
Navajo Sandstone, sedimentation: Marzolf, John. 00648
Trilobita
Ordovician
New York–Vermont, Champlain Valley, Chazy Group: Shaw, Frederick C. 07019
Tsunamis
Alaska
1788, Aleutian Islands, Sanak–Kodiak: Solov'yev, S. E. 07054
Tungsten
South Dakota
Harney Peak dome, southwestern, genesis: Kernaghan, James S. 06891
Unconformities
California
Cretaceous, Aptian, Budden Canyon Fm., Shasta County: Murphy, Michael A. 00636
Cretaceous–Tertiary boundary
New Jersey, Delaware, Maryland: Minard, James P. 00752
Nevada
Cambrian, Ruby Mountains: Kistler, Ronald W. 00655
New Mexico
Cretaceous, post–Morrison: Nash, J. Thomas. 06991
United States
Absolute age
C–14, Florida State University list: Martin, J. R. 00832
C–14, ISOTOPES' list: Buckley, James D. 00834
C–14, Ohio Wesleyan University list: Ogden, J. Gordon, 3d. 00836
C–14, Smithsonian Institution list: Mielke, James E. 00837
C–14, U.S. Geological Survey list: Marsters, Beverly. 00838
Southeastern, Precambrian volcanics, zircon, Pb–U: Rankin, D. W. 00740
Earthquakes
1960, western, microtremors, observations: Tanaka, Teiji. 07049
Economic geology
Oil shale, western, possibilities as liquid fuel: Katell, Sidney. 06846
Engineering geology
Earthquakes, micro, ground conditions in aseismic design: Tanaka, Teiji. 07049
General
Southeastern, directory of research: Clarke, James W. 00826
Geochemistry
Coals and carbonaceous materials, X-ray diffraction studies: Ergun, Sabri. 07012

United States
Geochemistry
Colorado River basin, vanadium, occurrence: Linstedt, Kermit Daniel. 00854
Geomorphology
East coast, submarine canyons: Uchupi, Elazar. 07060
Geophysical surveys
Western, aeromagnetic anomalies, relations to ore deposits: Zietz, I. 06864
Western, crustal structure, seismic data: Claus, Prodehl. 00726
Hydrogeology
Conterminous, ground-water resources, mineralized: Feth, J. H. 00718
Z ational Hydrologic Bench-Mark Network: Cobb, Ernest D. 00716
Northeastern, resources, effects of 1961-67 drought: Barksdale, Henry C. 06967
Paleontology
Asterozoa, Mississippian, central, ophiuroids: Bjork, Philip R. 06901
Mollusca, Cretaceous, western interior, ammonites: Cobban, William A. 00975
Petrology
Northwestern, Plio-Pleistocene mesa basalt sheet: Walker, G. W. 00936
Sedimentary petrology
Great Basin, Cambrian dolomite, precipitation on sea-floor: Kepper, John C. 00629
Uplifts
Nevada
Timber Mountain, resurgent dome, fault systems: Carr, W. J. 06817
Wyoming
Bighorn Mountains, east flank, drainage evidence: Nelson, Robert S. 06948
Uranium
Abundance
Barite, marine vs. continental: Goldberg, Edward D. 00760
New Mexico
Laguna district, genesis: Nash, J. Thomas. 06991
Resources
Automatic data processing, predictions: Bostick, N. H. 06831
Texas
Coastal Plain, genesis: Eargle, D. Hoye. 00971
Utah
Absolute age
Basement rocks, Precambrian: Stacey, J. S. 06945
Bull (alley district, volcanics, K-Ar: Blank, H. Richard. 00679
Areal geology
Milford Flat quadrangle: Abou-Zied, Mohamed Saleh. 00856
Economic geology
Copper, Bingham Canyon, open pit, geologic mapping: Smith, W. H. 06885
Mineral belts, fault trends, exploration guide: Stokes, William Lee. 06985
Utah
Economic geology
Mineral resources, Causey Dam quadrangle: Mullens, Thomas E. 00824
Polymetallic ores, Star district, Old Moscow mine: Abou-Zied, Mohamed Saleh. 00856
Salt, Great Salt Lake: Straesser, Manfred. 06993
Geochemistry
Bull Valley district, volcanics, chemical variations: Blank, H. Richard. 00679
Lead, isotopes, ore deposits: Stacey, J. S. 06945
Geomorphology
Great Salt Lake, fluctuations in size: Straesser, Manfred. 06993
Hydrogeology
Navajo Indian Reservation, ground-water resources: Cooley, M. E. 00959
Maps, geologic
Causey Dam quadrangle: Mullens, Thomas E. 00824
Navajo Indian Reservation: Cooley, M. E. 00959
Maps, mineral resources
Mineral production: Stokes, William Lee. 06985
Paleontology
Mammalis, Eocene, Green River Formation, antiacodont: Burke, J. J. 00847
Sedimentary petrology
Navajo Sandstone, primary structures, regional variations: Marzolf, John. 00648
Stratigraphy
Cambrian-Quaternary, Causey Dam quadrangle, sections: Mullens, Thomas E. 00824
Vanadium
Abundance
Water, Colorado River basin: Linstedt, Kermit Daniel. 00854
Veins
Genesis
Strontium isotopes: Reesman, R. H. 06990
Vermont
Paleontology
Trilobita, Ordovician, Chazy Group, Champlain Valley: Shaw, Frederick C. 07019
Stratigraphy
Ordovician, Chazy Group, Champlain Valley, correlation: Shaw, Frederick C. 07019
Structural geology
West-central, boudin development, Sudbury thrust: Voight, Barry. 00873
Vertebrata
Cretaceous
Montana, Judith River Fm: Sahni, Ashok. 00869
Tertiary
Kansas, Trego County, WaKeeney local fauna: Wilson, Richard Leland. 06938
South Dakota, Brule Fm, Oligocene: Lillegraven, Jason A. 00659

Volcanism
Mechanism
Ash-flow sheets, eruption energy, subsidence, form: Noble, Donald C. 00640

Volcanoes
Hawaii
Kilauea, tilt, 1965–68: Fiske, Richard S. 00713
Washington
Goat Rocks volcano: Ellingson, Jack A. 00693
World
Major eruptions, 1968: Melson, William G. 00746

Washington
Areal geology
Cascade Mountains, Goat Rocks volcano: Ellingson, Jack A. 00693
Cascade Mountains, southern, Paleozoic history: Ellingson, Jack A. 00694
Economic geology
Clays, Spokane County: Hosterman, J. W. 00825
Geomorphology
Columbia River effluent system, sediment transport: Conomos, T. J. 00884
Continental shelf, sediment transport, processes: Harman, Robert A. 00915
Glacial geology
Fidalgo Island, glacial grooves, erosion surfaces: Danner, Wilbert R. 00691
Mount Adams, south slope, late Quaternary: Hopkins, Kenneth D. 00628
Mount Rainier, Emmons Glacier, P-wave velocity: Ruter, H. 06957
Skagit Valley, anomalous cross section, glacial erosion: Weis, Paul L. 00803
Maps, geologic
Chewelah Mountain quadrangle: Clark, Lorin D. 07057
Eagle Mountain area, mines: Clark, Lorin D. 07057
Mica-Manito-Saxby area, pre-Palouse geology: Hosterman, J. W. 00825
Paleontology
Mammalia, Pliocene, Ellensburg Formation, new mustelid: Bryant, Laurie J. 06802
Petrology
Cascades, Chiwaukum Schist, contact metamorphism: Plummer, Charles C. 00817
Sedimentary petrology
Continental shelf, sediments, texture variance: Kelley, James C. 00917
Point Roberts, interglacial sequence, sedimentary structures: Danner, Wilbert R. 00692
Sediment-foram relations, inner sublittoral zone: Echols, Ronald J. 00916
Stratigraphy
Quaternary, glacial deposits, volcanics, Mount Adams: Hopkins, Kenneth D. 00628
Tertiary, Columbia River Basalt, Yakima area: Holmgren, Dennis A. 00675

Washington
Structural geology
Whatcom-Skagit Counties, Cretaceous thrusting, western extent: Miller, Gerald M. 00651

Weathering
Florida
Okeechobee County, soil genesis, deep profile studies: Fiskell, J. G. A. 06950
Western, Magnolia and Greenville soils, genesis: Caldwell, R. E. 06951
Western, Marlboro and Faceville soils, genesis: Dantzman, C. L. 06964
New Jersey
Triassic argillite and shale, clay mineralogy: Lodding, William. 07030
Quebec
Saint Hyacinthe County, St. Jude soil: Ledoux, Robert. 06932
Saprolite
Washington, Spokane County: Hosterman, J. W. 00825

Well logging
Electrical
Application to rock mechanics, coal mines: Bond, L. O. 06829
Methods, saline aquifers, Louisiana: Turcan, A. N., Jr. 00721
General
Applications, hydrologic studies: Johnson, A. I. 07034
California, Rancho Seco Nuclear Generating Station, drill holes: Campbell, D. G. 00697
Interpretation, volcanic rocks, Nevada Test Site: Carroll, Roderick D. 06819
Log-Test-Log
Instrumentation, principles, application: Powell, A. R. 07004
Seismic
Three-dimensional depth computation: Sattlegger, J. W. 00979

Wells and drill holes
Alabama
Conecuh County, well and spring records: Reed, P. C. 07071
Covington County, well and spring records: Turner, J. D. 06966
Crenshaw County, well records: McWilliams, R. G. 07074
Dale County, well records: Newton, J. G. 07073
Henry County, well and spring records: Newton, J. G. 07075
Pike County, well and spring records: Shamburger, V. M., Jr. 07070
California
Fremont Valley area, drillers' logs: U.S. Geological Survey. 00960
Rancho Seco Nuclear Generating Station, cores: Campbell, D. G. 00697
Mexico
Yucatan Peninsula, wells, basement rocks: Bass, M. N. 00730

Wells and drill holes
Michigan
Gogebic County, drillers' logs: Doonan, C. J. 06989
South Dakota
Sioux Falls area, test-hole logs: Vaughan, Kenneth D. 06892
Wyoming
Yellowstone Park drill hole Y-1, hydrothermal minerals: Honda, S. 00750
West Indies
Absolute age
C-14, Dominica Island, U.S. Geological Survey list: Marsters, Beverly. 00838
Areal geology
Bonaire: Zonneveld, J. I. S. 07046
Montserrat, southern: Rea, W. J. 06953
Petrology
Lesser Antilles, lava, island-arc development stage from composition: Baker, P. E. 07014
Wisconsin
Geochemistry
Southwestern, geochemical prospecting, zinc: DeGeoffroy, J. 06944
Glacial geology
Kettle Interlobate Moraine, features: Black, Robert F. 00827
Stratigraphy
Ordovician, Champlainian Series, revision: Ostrom, Meredith E. 00751
Wyoming
Economic geology
Mineral resources, Teton Pass quadrangle: Schroeder, Marvin L. 00844
Petroleum and natural gas, Iron Creek field: Dahill, Murray P. 06983
Geochemistry
Absaroka volcanic field, Pb, Sr isotopes: Peterman, Zell E. 00821
Wind River basin, petroleum, sulfur isotopes: Vredenburgh, Larry Dale. 00874
Geomorphology
Big Horn Mountains, drainage, pre-Pleistocene relicts, Buffalo area: Nelson, Robert S. 06948
Geophysical surveys
Yellowstone Park, infrared data, calibration in heat flow units: White, Donald E. 00749
Maps, geologic
Teton Pass quadrangle: Schroeder, Marvin L. 00844
Mineralogy
Clay minerals, Gypsum Spring and Sundance Fms.: Furlong, Robert B. 06946
Hydrothermal minerals, Yellowstone Park drill hole Y-1: Honda, S. 00750
Petrology
White Mountain, marble, sedimentary, not volcanic: Nelson, Willis H. 00639
Stratigraphy
Middle, Late paleoenvironment, Jurassic, Big Horn Mts.: Furlong, Robert B. 06946
Teton Pass quadrangle, sections: Schroeder, Marvin L. 00844
Wyoming
Structural geology
Big Horn County, Sheep Mtn. anticline: Johnson, Gary D. 06982
White Mountain, Heart Mtn. fault block: Nelson, Willis H. 00639
X-ray diffraction analysis
Data
Clay minerals, Wyoming, Big Horn Mts., Jurassic strata: Furlong, Robert B. 06946
Coal and carbonaceous materials: Ergun, Sabri. 07012
Sediments, mineral composition, Caribbean Sea: Griffin, John J. 00767
Senaite: Rouse, Roland C. 07005
Methods
Fabric analysis: Chakrabarti, A. K. 00699
Quantitative, multicomponent mineral systems: Moore, Charles A. 06958
Yukon
Maps, magnetic
Arrowhead Lake area, airborne: Canada Geological Survey. 07101
Blind Lakes area, airborne: Canada Geological Survey. 07108
Einarson Creek area, airborne: Canada Geological Survey. 07096
Emerald Creek area, airborne: Canada Geological Survey. 07098
Itsi Lakes area, airborne: Canada Geological Survey. 07119
Jackfish Lake area, airborne: Canada Geological Survey. 07113
Keele Peak area, airborne: Canada Geological Survey. 07105
Laforce Lake area, airborne: Canada Geological Survey. 07109
Marjorie Lake area, airborne: Canada Geological Survey. 07111
Marmot Creek area, airborne: Canada Geological Survey. 07102
Mount Selous area, airborne: Canada Geological Survey. 07110
Pelly Lakes area, airborne: Canada Geological Survey. 07116
Sheet 105 J:9, airborne: Canada Geological Survey. 07118
Sheet 105 O:12, airborne: Canada Geological Survey. 07097
Sheet 105 O:1, airborne: Canada Geological Survey. 07104
Sheets 105 J:5, J:12, J:13, J:3, airborne: Canada Geological Survey. 07112
Sheets 105 J:14, J:2, J:7, J:10, J:15, airborne: Canada Geological Survey. 07115
Sheets 105 O:4, O:3, airborne: Canada Geological Survey. 07099
Sheets 105 O:9, O:16, airborne: Canada Geological Survey. 07106
Sheets 105 O:15, O:10, O:7, O:2, airborne: Canada Geological Survey. 07103
Sheldon Lake area, airborne: Canada Geological Survey. 07114

Yukon
Maps, magnetic
Tenas Creek area, airborne: Canada Geological Survey. 07107
Wolf Canyon area, airborne: Canada Geological Survey. 07117
Stratigraphy
Paleozoic, Upper, Atlin horst: Monger, J. W. H. 00654

Zinc
Exploration
Spring sampling: DeGeoffroy, J. 06944
Geochemistry
System Zn–Fe–S: Campbell, F. A. 06975
System Zn–Fe–S: Chernyshev, L. V. 06979
System Zn–Fe–S: Einaudi, Marco T. 06976
Maine
Southeastern, occurrence, exploration: Hodder, R. W. 06873
Tennessee
Eastern, geochemical prospecting: Carpenter, R. H. 06834